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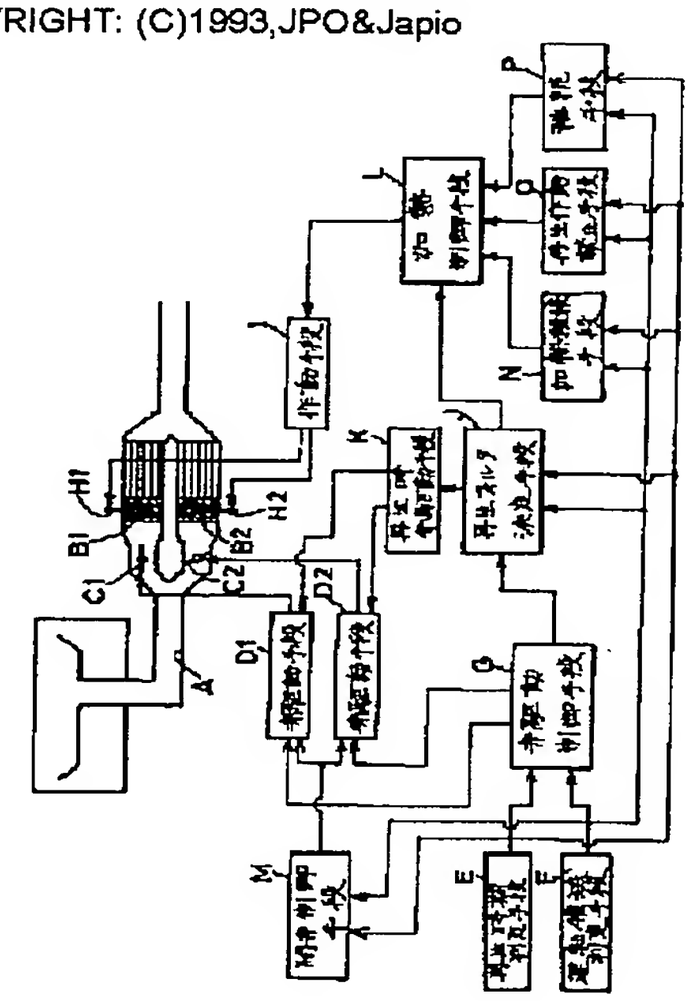
(54) EXHAUST EMISSION CONTROL DEVICE OF INTERNAL COMBUSTION ENGINE

(57) Abstract:

PURPOSE: To miniaturize an exhaust emission control device while preventing the discharge of the ingredient of exhaust particulates and the like into the atmosphere so as to enable the device to be mounted on a small car and the like.

CONSTITUTION: Filters B1, B2 are installed in an exhaust gas passage A in parallel rows and also control valves C1, C2 for controlling exhaust gas flow to respective filters are installed. Heaters H1, H2 are provided in respective filters. In the case of collection in a running area for receiving small amount of exhaust gas, the exhaust gas is introduced into two filters B1, B2 alternately and in the case of collection in a running area for receiving a large amount of exhaust gas, the exhaust gas is introduced into two filters B1, B2 simultaneously. In the case of regeneration in the running area for receiving a small exhaust amount, the filters B1, B2 on the control valve opening side are regenerated by the electricity transmission to the heater H1, H2 just before the time of judging a regeneration timing and in the running area for receiving a large exhaust gas amount, the exhaust gas is introduced to both filters B1, B2 simultaneously so as to regenerate the filters.



CLAIMS

[Claim(s)]

[Claim 1]An exhaust emission control device of an internal-combustion engine characterized by comprising the following.
Two or more filters which are infixed in parallel with an organization flueway and catch exhaust air particles.
Two or more exhaust-stream control valves which are provided for this every filter or every predetermined filter group, and control an exhaust flow to a filter.
A valve driving means which carries out the opening-and-closing drive of these exhaust-streams control valve, respectively.
A regenerating period judging means which judges a regenerating period of said filter, and a operating-range judging means which judges a operating range corresponding to displacement based on an engine operation state, When it is judged with a non-regenerating period of said filter and displacement is judged to be few operating range, exhaust air is made to introduce into said filter or a predetermined filter group by turns, A drive control means which carries out drive controlling of said exhaust-stream control valve via said valve driving means in order to make it introduce into all the filters, when it is judged with a non-regenerating period of said filter and is judged with a operating range with much displacement.

[Claim 2]An exhaust emission control device of the internal-combustion engine according to claim 1 characterized by comprising the following.
Two or more heating methods which are established for every filter or every predetermined filter group, and heat a filter.
An operating means which operates these heating methods.
A reproducing filter determination means to determine a filter or a filter group which should be reproduced based on a switching condition of an exhaust-stream control valve just before being judged with a regenerating period when it is judged with a regenerating period and displacement is exhausted with few operating range.

A heating control means to which the heating operation of the heating method of a determined filter or a filter group is carried out via an operating means.

[Claim 3]A reproducing filter determination means is determined as a filter which should reproduce a filter or a filter group by which an exhaust-stream control valve is opened just before being judged with a regenerating period, or a filter group, And an exhaust emission control device of the internal-combustion engine according to claim 2 provided with a valve driving means at the time of reproduction which carries out the valve-opening drive of the remaining exhaust-stream control valves currently closed just before [which carries out the valve-closing drive of a determined filter or an exhaust-stream control valve of a filter group] being judged with a regenerating period on the other hand.
[Claim 4]A valve-opening control means which carries out the valve-opening drive of those filters or the exhaust control valve of a filter group in order to reproduce by making exhaust air flow into all the filters or filter groups, when it is judged with a regenerating period and judged with a operating range with much [or] displacement where an exhaust-gas temperature is high, An exhaust emission control device of the internal-combustion engine according to claim 2 which it has.
[Claim 5]An exhaust emission control device of the internal-combustion engine according to claim 2 or 3 characterized by comprising the following.
a period until reproduction of a filter or a filter group determined by a reproducing filter determination means is completed -- a heating continuation means to make an operation of a heating method which heats these filters continue.
A reproduction operation inhibiting means to which other filters or a reproduction operation of a filter group is forbidden until it carries out prescribed period progress from a time of reproduction of a filter or a filter group being completed.

[Claim 6]While reproducing by operating a heating method, when it goes into a operating range with much [or] displacement where an exhaust-gas temperature is high, a predetermined filter or a filter group, An exhaust emission control device of the internal-combustion engine [provided with a continuation means to make an operation of said heating method continue during a prescribed period since it went into said operating range] according to claim 3.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the exhaust emission control device of an internal-combustion engine.

[0002]

[Description of the Prior Art]As a conventional example of the exhaust emission control device of an internal-combustion engine, there is a thing as shown in JP,63-134808,A. This thing infixes the trap which catches the particles under exhaust air to the flueway of an organization, and he is trying to form the bypass channel which bypasses a trap. And if it energizes to the heater of a trap inlet section and trap inlet temperature becomes more than prescribed temperature when judged with the regenerating period of a trap, the valve of a trap entrance will be made to closed-drive to a prescribed opening, and, as for the remaining exhaust air, a bypass channel will be circulated. And when the relative oxygen density difference of the oxygen concentration sensor allocated in the entrance side and outlet side of a trap becomes below a predetermined value, judge that reproduction was completed, and the energization to a heater is stopped, and the fully opening drive of said valve is carried out.

[0003]When judged with a regenerating period, the thing of JP,59-85417,A circulates exhaust air to a bypass channel, and reproduces a trap, and it judges reproduction end time by the lapsed time of trap reproduction starts, and he is trying to terminate reproduction of a trap. The thing of JP,59-20515,A circulates exhaust air to a bypass channel at the time of reproduction of a trap, and when the outlet temperature of a trap becomes more than prescribed temperature, it judges with the time of the end of reproduction, and he is trying to terminate reproduction of a trap.

[0004]

[Problem(s) to be Solved by the Invention]However, in such a conventional exhaust emission control device, Since he is trying to discharge the great portion of exhaust air in the atmosphere via a bypass channel during reproduction of a trap, Even if the exhaust air

ingredient which an engine operation state changes during reproduction (load changes), and is discharged from an organization gets worse (for example, a smoke will be in a visible state), there is its fault of being unable to respond but emitting exhaust air into the atmosphere as it is.

[0005]For this reason, in JP,1-232105,A, JP,3-27820,U, etc., a trap is infixed in parallel with a flueway, exhaust air is circulated in the trap of another side during reproduction of one trap, and what switches reproduction and catching by turns and performs them is proposed in recent years. However, since the exhaust air ingredient emitted into the atmosphere during reproduction does not get worse in these things since exhaust air only circulates one of traps, but the trap is allocated in parallel, The whole system is enlarged and there is fault that loading to vehicles becomes difficult (in order to pipe an exhaust system in it, it is necessary to change the floor shape of vehicles, etc. substantially). It is difficult for especially this fault to allocate a trap in parallel in that by which under floor spaces, such as a small passenger car, are restrained, and to switch an exhaust stream to the it catching- and reproduction side by turns.

[0006]This invention was made in view of such the actual condition, and it attains the miniaturization of an exhaust emission control device, preventing discharge into the atmosphere of ingredients, such as exhaust air particles, and an object of this invention is to enable it to carry in an exhaust emission control device also in a subcompact etc.

[0007]

[Means for Solving the Problem]For this reason, two or more filters B1 and B-2 which are infixed in parallel with the organization flueway A, and catch exhaust air particles as this invention is shown in drawing 1 in claim 1, Two or more exhaust-stream control valves C1 and C2 which are provided for this every filter or every predetermined filter group, and control an exhaust flow to a filter, These exhaust-streams control valve C1, the valve driving means D1 which carries out the opening-and-closing drive of C2, respectively, and D2, The operating-range judging means F which judges a operating range corresponding to displacement based on the regenerating period judging means E and an engine operation state of judging a regenerating period of said filter. When it is judged with a non-regenerating period of said filter and displacement is judged to be few operating range. When it is alike and exhaust air was made to introduce into said filter or a predetermined filter group by turns, and it is judged with a non-regenerating period of said filter and is judged with a operating range with much displacement. It had said driving means D1 and the valve drive control means G which carries out drive controlling of said exhaust-stream control valve C1 and C2 via D2 in order were alike and to have been introduced into all the filters.

[0008]In claim 2, in addition to claim 1, as shown in drawing 1, When it is judged with the heating method H1 and H2 which are provided for every filter or every predetermined filter group, and heat a filter, and the operating means I and a regenerating period which operate these heating methods and displacement is judged to be few operating range, A

reproducing filter determination means J to determine a filter or a filter group which should be reproduced based on the exhaust-stream control valve C1 just before being judged with a regenerating period, and a switching condition of C2. It had a determined filter or the heating method E1 of a filter group, and the heating control means K to which the heating operation of E2 is carried out via the operating means I.

[0009]In claim 3, the reproducing filter determination means J in claim 2 is determined as a filter which should reproduce a filter or a filter group by which the exhaust-stream control valve C1 and C1 are opened just before being judged with a regenerating period, or a filter group, And it had the valve driving means K at the time of reproduction which carries out the valve-opening drive of the remaining exhaust-stream control valves currently closed just before [which carries out the valve-closing drive of a determined filter or the exhaust-stream control valve C1 of a filter group, and C2] being judged with a regenerating period on the other hand.

[0010]In claim 4, in addition to claim 2, as shown in drawing 1, it is judged with a regenerating period, And it had the exhaust-stream control valve C1 and the valve-opening control means M which carries out the valve-opening drive of C2 in order to have made exhaust air flow into all the filters or filter groups, when judged with a operating range with much [or] displacement where an exhaust-gas temperature is high. moreover -- in claim 5 -- claim 2 or claim 3 -- in addition, a period until reproduction of a filter or a filter group determined by the reproducing filter determination means J is completed -- with the heating method E1 which heats them, and a heating continuation means N to make an operation of E2 continue. It had the reproduction operation inhibiting means O to which other filters or a reproduction operation of a filter group is forbidden until it carried out prescribed period progress from a time of reproduction of a filter or a filter group being completed.

[0011]In claim 6, to claim 3, in addition, while reproducing a predetermined filter or a filter group by operating the heating method E1 and E2, when it goes into a operating range with much [or] displacement where an exhaust-gas temperature is high, Since it went into said operating range, it had said heating method E1 and a continuation means P to make an operation of E2 continue, during a prescribed period.

[0012]

[Function]And in claim 1, allocate two or more filters in an engine intake passage in parallel, and. The exhaust-stream control valve which controls the exhaust flow to a filter for every filter or every predetermined filter group is provided, While switching for every filter or filter group at the time of exhaust air particle catching in a operating range with little displacement and making exhaust air introduce into a filter, By passing exhaust air to all the filters or filter groups at the time of exhaust air particle catching in a operating range with much displacement, Since it was made to correspond to increase of displacement and filter capacity was increased, preventing discharge into the atmosphere of exhaust air particles, the miniaturization of the full capacity of a filter could be attained, and exhaust air particles were caught like abbreviation in each filter, and regeneration was closed if easy.

[0013]When displacement was few operating range at the time of a regenerating period judging, the filter or filter group which should be reproduced based on the switching condition of the exhaust-stream control valve in front of a regenerating period judging is determined, a heating method is operated, and it enabled it to reproduce a filter in claim 2 at the optimal stage. In claim 3 as the concrete composition, the filter or filter group by which the exhaust-stream claim valve is opened just before the regenerating period judging should be reproduced -- it determining and. Carry out the valve-opening drive of the exhaust-stream control valve which carries out the valve-closing drive of those exhaust-stream control valves and which is closed on the other hand at the time of a regenerating period judging, and it enables it to reproduce at the optimal stage when the temperature of a filter is high, and enabled it to shorten regeneration time.

[0014]In claim 4, it reproduces by making exhaust air flow into all the filters or filter groups in a operating range with much [or] displacement where an exhaust-gas temperature is high at the time of a reproduction judging, Having prevented discharge into the atmosphere of exhaust air particles, and controlling an exhaust-gas-pressure rise, it is made to correspond to increase of displacement, filter capacity is increased, and it enabled it to attain the miniaturization of the full capacity of a filter also by this.

[0015]Operate a heating method, and it is good and enables it to perform reproduction in claim 5 for a short time until reproduction is completed at the time of reproduction in a operating range with little displacement, When other filters or the reproduction operation of a filter group was forbidden and an electric heater was used for a heating method until it carried out prescribed period progress from the time of reproduction being completed, it enabled it to ease the burden of the power supply system of a battery etc.

[0016]In claim 6, when it goes into a operating range with much [or] displacement where an exhaust-gas temperature is high at the time of reproduction in a operating range with little displacement, When it went into a operating range with little [again] displacement and an electric heater was used as a heating method, it was made to reproduce by making the operation of the heating method between predetermined time continue, since it went into the operating range the optimal by making the burden to the power supply system by incoming current ease.

[0017]

[Example]Below, one example of this invention is described based on drawing 2 - drawing 6. In drawing 2, the flueway 2 of the diesel engine 1 branches on the way, and the 1st branch passage 3 and the 2nd branch passage 4 are formed. The 1st catalyst device 5 of honeycomb shape is infixed in said 1st branch passage 3, and the 1st filter 6 that catches exhaust air particles is infixed in the 1st branch passage 3 of the 1st catalyst device 5 upper stream. The 1st heater 7 as a heating method is inserted in said 1st filter 6, and it energizes from the 1st energization circuit 8 as an operating means to the 1st heater 7. The 1st control valve 9 as an exhaust-stream control valve is infixed in the 1st branch passage 3 of said 1st filter 6 upper stream, and the opening-and-closing drive of the 1st control valve 9 is

carried out by the 1st drive 10, such as a step motor as a valve driving means.
[0018]On the other hand, the 2nd catalyst device 11 of honeycomb shape is infixed in said 2nd branch passage 4, and the 2nd filter 12 that catches exhaust air particles is infixed in the 2nd branch passage 4 of the 2nd catalyst device 11 upper stream. The 2nd heater 13 as a heating method is inserted in said 2nd filter 12, and it energizes from the 2nd energization circuit 14 as an operating means to the 2nd heater 13. The 2nd control valve 15 as an exhaust-stream control valve is infixed in the 2nd branch passage 4 of said 2nd filter 12 upper stream, and the opening-and-closing drive of the 2nd control valve 15 is carried out by the 2nd valve drive 16, such as a step motor as a valve driving means.
[0019]Drive controlling of said 1st and 2nd energization circuits 8 and 14 is carried out by the control device 17 which consists of microcomputers etc., and they perform energization control to the 1st and 2nd heaters 7 and 13. Drive controlling of the 1st and 2nd drive valve gears 10 and 16 is carried out by said control device 17, and they carry out opening and closing control of the 1st and 2nd control valves 9 and 15. Various detecting signals, such as a control-lever opening (or accelerator opening) of a fuel injection pump (not shown), engine operation speed, and circulating water temperature, are inputted into said control device 17.
[0020]Here, the control device 17 constitutes a valve driving means, a heating control means, a heating continuation means, a reproduction operation inhibiting means, and a continuation means like the after-mentioned at the time of a regenerating period judging means, a operating-range judging means, a valve-opening control means, a valve drive control means, a reproducing filter determination means, and reproduction. Next, an operation is explained according to the flow chart of drawing 3 and drawing 4. In S1, various detecting signals, such as an accelerator opening and organization revolving speed, are read.
[0021]In S2, it judges whether prescribed period progress was carried out from the time of the last end of reproduction of the 1st filter 6 or the 2nd filter 12, and it progresses to S4, without progressing to S3 at the time of YES, and passing S3 at the time of NO. In S3, it judges whether it is a regenerating period of the 1st filter 6 and the 2nd filter 12, progresses to S12 at the time of YES, and progresses to S4 at the time of NO. Therefore, this portion constitutes the regenerating period judging means of claim 1. Here, the judgment of a regenerating period is judged with the value adding the product (exhaust air particle amount caught by the filter) of the exhaust air particle amount (it can judge from the operational status of an organization) discharged, for example from a diesel engine, and the collection efficiency of a filter.
With this device, it is judged with a regenerating period until both 1st and 2nd filters 6 and 12 end reproduction.
Judging the existence of whether to have carried out prescribed period progress from the time of the last end of reproduction of the 1st filter 6 or the 2nd filter 12 in S2, If reproduction with the 1st filter 6 and the 2nd filter 12 is performed continuously, it is made

to stop the prescribed period reproduction operation after the end of reproduction of one filter, since the burden of a power supply system increases. Charge of the power supply system exhausted at the time of reproduction is made to ensure by this, and it enables it to put an organization into operation certainly at the time of the restart after reproduction, etc. Therefore, the portion of S2 constitutes the reproduction operation inhibiting means of claim 5.

[0022]In S4, based on the control-lever opening and organization revolving speed which were detected, it judges whether it is the operating range A with little displacement, and progresses to S5 at the time of YES, and a operating range of an organization judges it as the operating range B with much displacement at the time of NO, and progresses to S10. Here, as shown in drawing 5, said operating range A and B is made to correspond to organization revolving speed and torque (it can determine from organization rotation operation and a control-lever opening), and is set up.

The operating range A is set up organization revolving speed fall as torque becomes high. Therefore, this portion constitutes a operating-range judging means.

[0023]In S5, it judges whether the 1st control valve 9 was made to close in the last operating range A, progresses to S6 at the time of YES, and progresses to S8 at the time of NO. And in S6, the valve-closing drive of the 2nd control valve 15 is carried out via the 2nd valve drive 16, and the valve-opening drive of the 1st control valve 9 is carried out via the 1st valve drive 10 S7. On the other hand, in S8, the valve-closing drive of the 1st control valve 9 is carried out via the 1st valve drive 10, and the valve-opening drive of the 2nd control valve 15 is carried out via the 2nd valve drive 16 at S9.

[0024]Thereby, in the operating range A with little displacement, since the 1st control valve 9 and the 2nd control valve 15 switch by turns and an opening-and-closing drive is carried out, exhaust air is introduced into the 1st filter 6 and the 2nd filter 12 by turns, and the exhaust air particles of an almost same amount can be caught in each filters 6 and 12. On the other hand, the 1st control valve 9 is made to open in S10, and the 2nd control valve 15 is made to open in S11, when a operating range is judged in S4 to be the operating range B with much displacement. Thereby, since the 1st and 2nd control valves 9 and 15 are opened, in order that exhaust air may be simultaneous in the 1st filter 6 and the 2nd filter 12 and may carry out an almost same amount inflow at them, in the 1st and 2nd filters 6 and 12, the exhaust air particles of an almost same amount are caught [in / both / the operating range B].

[0025]Therefore, S6-S11 constitute a valve driving means. Since the exhaust air to one filters 6 and 12 is intercepted whenever this goes into the operating range A from the operating range B where an exhaust-gas temperature is high, one side of the filters 6 and 12 and one side of the 1st and 2nd catalyst devices 5 and 11 are kept warm. For this reason, since evaporation of SOF (substance meltable to an organic solvent) adhering to one filters 6 and 12 and oxidation of SOF in one catalyst devices 5 and 11 are maintainable good, It can decrease the SOF coating weight to a filter, and it can make an exhaust-air-

purification state good, and a reproduction interval is not only extensible, but can make exhaust property good. Since the exhaust flow rate within a filter will fall if it constitutes here so that exhaust air may be simultaneously passed in both the filters 6 and 12 even in the operating range A, Since the exhaust air particle amount which adheres to a filter in the state of being easy to break away increases, . In the operating range A, evaporation of SOF and oxidation with a catalyst almost become impossible, and a reproduction interval becomes short there is not only fault which exhaust air particles secede from a filter to accelerating operation with a quick exhaust flow rate, etc., and is discharged in the atmosphere, but, and worsen exhaust property. Since an exhaust flow rate will become quick if exhaust air is made to introduce into the filters 6 and 12 by turns, can prevent exhaust air particles from not being caught by the filter in the state where exhaust air particles tend to break away, and being emitted into the atmosphere at the time of accelerating operation, etc., and. It can promote evaporation of SOF, and oxidation with a catalyst, and a reproduction interval is not only extensible, but can make exhaust property good. .

[0026]At the time of exhaust air particle catching, the 1st and 2nd heaters 7 and 13 are maintained by the non-energization condition. On the other hand, when judged with a regenerating period in S3, in S12, based on the control-lever opening and organization revolving speed which were detected, it judges whether a operating range is the operating range C, and progresses to S13 at the time of YES, and at the time of NO, a operating range judges it as the operating range D, and progresses to S24 of drawing 4. Here, as shown in drawing 6, said operating range C and D is made to correspond to organization revolving speed and torque, and is set up, and the operating range C is set up organization revolving speed fall as torque becomes high. Displacement is fields fewer than a predetermined value, and the operating range C is set as a operating range lower than the field or the evaporation of SOF whose exhaust-gas temperature is lower than the temperature in which self-combustion [particles / exhaust air] is possible, and the exhaust-gas temperature which can be oxidized, as shown in drawing 6. It is a field with more displacement than a predetermined value where an exhaust-gas temperature is high, and the operating range D is set as the field higher than evaporation of SOF, and the exhaust-gas temperature which can be oxidized, or the field where an exhaust-gas temperature is higher than the temperature in which self-combustion of exhaust air particles is possible, as shown in drawing 6.

[0027]in S13, it should judge whether just before being judged with a regenerating period, the 2nd control valve 15 was opening, and the 2nd filter 12 should be reproduced at the time of YES -- it judges, and it progresses to S14, judges that the 1st control valve 9 was opening at the time of NO, and progresses to S19. Therefore, this portion constitutes the reproducing filter determination means in claim 2. In S14, it is judged whether reproduction of the 2nd filter 12 by the side of the 2nd control valve 15 was completed, It progresses to S15 in order to reproduce at the time of NO, at the time of YES, it returns to said S5, and

control in the catching state of exhaust air particles is performed until the open state in front of a regenerating period judging is judged in said S13 to be the 2nd control valve 15. This judgment is performed [both], in order not to perform reproduction operation of the 2nd filter 12 again where reproduction of the 2nd filter 12 is completed since the judgment of a regenerating period is not canceled unless the 1st and 2nd filters 6 and 12 end reproduction in said S3.

[0028]And when judged with reproduction of the 2nd filter 12 not being completed, in S15, the valve-closing drive of the 2nd control valve 15 is carried out, and the valve-opening drive of the 1st control valve 9 is carried out in S16. Therefore, this portion constitutes a valve driving means at the time of reproduction. While operating the 2nd energization circuit 14, energizing to the 2nd heater 13 and heating the 2nd filter 12, the operation of the 1st energization circuit 8 is stopped, the energization to the 1st heater 7 is stopped, and reproduction of the 2nd filter 12 is made to start by S18 S17. Performing this operation has here a high possibility that the direction which closed the 2nd control valve 15 at the time of reproduction while the 2nd control valve 15 was opening just before a regenerating period judging can hold the 2nd filter 12 and the 2nd catalyst device 11 to an elevated temperature, It is because time for the 2nd filter 12 to go up from the energization start time of the 2nd heater 12 even to prescribed temperature can be shortened. When circulating exhaust air in the 2nd filter 12 in the state of low load driving considerably before a regenerating period judging for a long period of time, Even if the 2nd control valve 15 is closed and it intercepts the exhaust flow to the 2nd filter 12, cannot hold the 2nd filter 12 to an elevated temperature, but. Since many exhaust air particles in the state of the temperature of the 2nd filter 12 being high rather than the 1st filter 6 with which exhaust air is intercepted, and being easy to break away are caught by the 2nd filter 12, it is advantageous to perform reproduction from the 2nd filter 12 that the 2nd control valve 15 is opening just before a regenerating period judging.

[0029]On the other hand, when judged with the 1st control valve 9 opening in S13, in S19, it judges whether reproduction of the 1st filter 6 by the side of the 1st control valve 9 was completed, returns to S5 at the time of YES, and progresses to S20 at the time of NO. And in S20, the valve-closing drive of the 1st control valve 9 is carried out, and the valve-opening drive of the 2nd control valve 12 is carried out in S21. While operating the 1st energization circuit 8, energizing to the 1st heater 7 and heating the 1st filter 6, the operation of the 2nd energization circuit 14 is stopped, the energization to the 2nd heater 12 is stopped, and reproduction of the 1st filter 6 is made to start by S23 S22. Therefore, the portion of said S13 and S20 constitutes the reproducing filter determination means of claim 3. The portions of S17, S19, and S22.S23 constitute the heating control means in claim 2, and the portions of S17 and S22 constitute the heating continuation means of claim 5.

[0030]When it is judged with a regenerating period and judged with a operating range being one of the operating range D, the 1st control valve 9 is made to open in S24 of drawing 4,

and the 2nd control valve 12 is made to open in S25, exhaust air is circulated in both the filters 6 and 12, and it progresses to S26. Therefore, S24 and S25 constitute the valve-opening control means in claim 4. In S26, after saying the operating range D, it judges whether prescribed period progress was carried out, and it progresses to S27 at the time of YES, and progresses to S29 at the time of NO.

[0031]And after going into the operating range D, when it is judged with having carried out prescribed period progress, the energization to the 1st heater 7 is stopped in S27, and the energization to the 2nd heater 13 is stopped in S28. On the other hand, after going into the operating range D, the energization to the 1st heater 7 or the 2nd heater 13 is made to continue in S29 at the time of less than a prescribed period. Therefore, this portion constitutes the continuation means of claim 6.

[0032]Since it is necessary to energize to a heater again and the burden of a power supply system will increase conversely under the influence of the incoming current to a heater when it returns to said operating range C immediately if it goes into the operating range D and the energization to a heater is stopped immediately, this, After carrying out prescribed period progress, it was made to stop the energization to a heater. As explained above, the 1st filter 6 and the 2nd filter 12 are arranged in parallel, Since exhaust air is circulated in one filters 6 and 12 in a operating range with little displacement and it was made to circulate exhaust air in both the filters 6 and 12 in a operating range with much displacement at the time of exhaust air particle catching, Since it is made to correspond to increase of displacement and filter capacity can be increased, preventing discharge into the atmosphere of exhaust air particles, full capacity of a filter can be made smaller than before, the miniaturization of an exhaust emission control device can be attained, and loading becomes possible at a subcompact etc. Since exhaust air was passed by turns in the 1st filter 6 and the 2nd filter 12 when there was little displacement, and exhaust air was passed in both the filters 6 and 12 at the time of catching when there was much displacement, Since the exhaust air particles of an almost same amount can be caught in both filters, it has the merit that collection volume is calculated on the whole and a regenerating period can be judged simply without the composition which has arranged the filter in parallel also calculating collection volume for every filter.

[0033]This is a merit which can simplify judgment logic at the time of the regenerating period judging by a driving history method.

When detecting differential pressure etc., it is a merit which can reduce the number of sensors.

Since he is trying to pass exhaust air in one filter in a operating range with little displacement, and the fall of an exhaust flow rate can be prevented, it is rare to be caught in the state of being easy to secede from exhaust air particles in a filter, and it can control the blowing off of the exhaust air particles in the time of acceleration, etc. When [with little displacement] an exhaust flow rate is slow here, in order to add catching of the exhaust air particles in the gestalt with which exhaust air particles adhere to the exhaust air particles

caught by the filter, apparent collection efficiency becomes high, but. Thus, the caught exhaust air particles are emitted at a stretch into the atmosphere at the time of acceleration, etc. that it is easy to break away, and do not contribute to the collection efficiency of vehicles. Since the exhaust flow to one filter is intercepted whenever it goes into a field with little displacement from a field with much displacement, Since the filter and catalyst are kept warm and oxidation of SOF in the evaporation and the catalyst in the filter of SOF can be maintained good, the decrease of the adhesion of SOF in a filter can be carried out, and a reproduction interval can be extended, and exhaust air purification can be maintained good, and exhaust property can be improved.

[0034]At the time of reproduction in a operating range with little displacement. By making the control valve of the side through which exhaust air is flowing just before the reproduction judging close, while filter temperature is high, since it energizes to a heater and was made to reproduce, the heating up time of a filter can be shortened, the burden of the power supply system of a heater is mitigable, and regeneration time can be shortened. Since exhaust air was passed in both the filters 6 and 12 at the time of reproduction of the field with much [or] displacement where an exhaust-gas temperature is high, The miniaturization of filter capacity can be attained, preventing discharge into the atmosphere of exhaust air particles also by this, and an exhaust-gas-pressure rise can be controlled and aggravation of the exhaust property accompanying an exhaust-gas-pressure rise can be prevented.

[0035]Since it was made to energize to a heater until reproduction was completed at the time of reproduction in a operating range with little displacement, it is good and reproduction can be performed in a short time. Since it was made for a prescribed period to forbid the reproduction operation of other filters after reproduction was completed, the burden of the power supply system of a heater is mitigable. Since it was made to make the energization to a prescribed period heater continue when it went into a operating range with much [or] displacement where an exhaust-gas temperature is high at the time of reproduction, the burden to the power supply system by the incoming current accompanying the re-energization to a heater when it goes into ****** to a heater again is mitigable.

[0036]When the number of filters is four, an exhaust-stream control valve may be provided every four filters, respectively, and it may be made to provide an exhaust-stream control valve in every two filters (filter group) again, respectively, although this example explained the case where the number of filters was two.

[0037]

[Effect of the Invention]In [as this invention explained above] claim 1, Allocate a filter in two or more parallel in a flueway, and the exhaust-stream control valve which controls the exhaust flow to a filter is provided in every filter or a filter group, On the other hand, when it was a operating range with much displacement which passes exhaust air by turns to a filter or a filter group when displacement is few operating range at the time of exhaust air particle

catching, exhaust air was passed to all the filters or filter groups.
Therefore, a filter can be miniaturized, and loading in a subcompact etc. is attained, judgment of a regenerating period can also be simplified, preventing discharge into the atmosphere of exhaust air particles, and a reproduction interval is also extensible.

[0038]In claim 2 and claim 3, at the time of reproduction of a operating range with little displacement. Since it was made to reproduce by determining the filter or filter group which should be reproduced based on the switching condition of the exhaust-stream control valve in front of a regenerating period judging, in addition to the effect of claim 1, the burden of the driving energy supply system of a heating method is mitigable. In claim 4, since it was made to reproduce to all the filters or filter groups by passing exhaust air in a operating range which has much displacement or where an exhaust-gas temperature is high at the time of a reproduction judging, in addition to the effect of claim 2, an exhaust-gas-pressure rise can be controlled, and aggravation of the exhaust property accompanying an exhaust-gas-pressure rise can be prevented.
[0039]Since a heating method is operated and it was made for a prescribed period to forbid other filters or reproduction of a filter group from the end time of reproduction in claim 5 until reproduction was completed at the time of reproduction in a operating range with little displacement, In addition to the effect of claims 2 and 3, it is good, and reproduction can be performed in a **** short time, and the burden of the driving energy supply system of a heating method is mitigable.
[0040]In claim 6, when it enters during reproduction in a operating range with much [or] displacement where an exhaust-gas temperature is high, Since it was made to make the operation of a prescribed period heating method continue, when it goes into a operating range with little [again] displacement, it can reproduce the optimal by making the burden of a driving energy supply system ease.

[Translation done.]

DESCRIPTION OF DRAWINGS

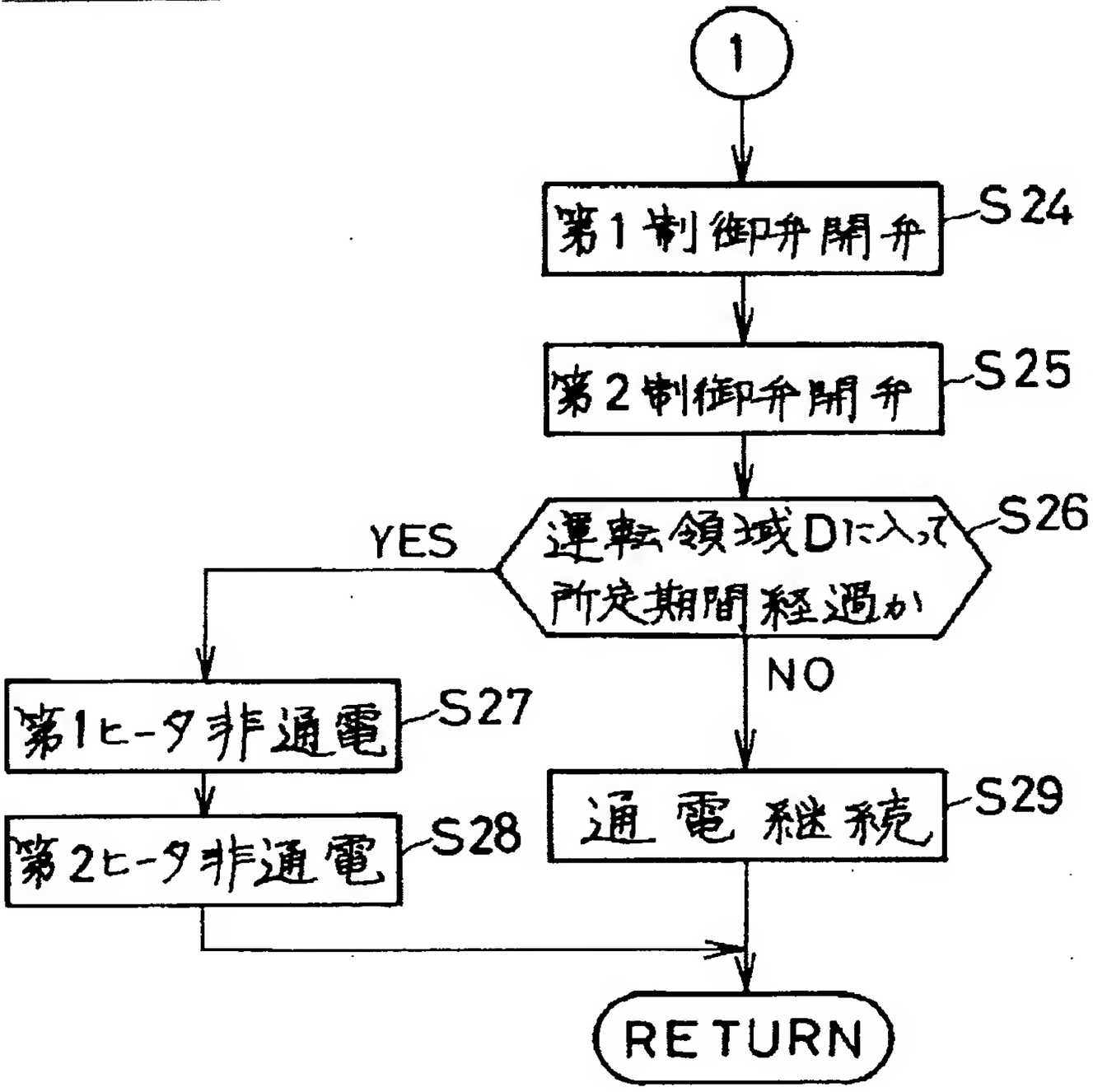
[Brief Description of the Drawings]

[Drawing 1]The figure corresponding to the claim of this invention.
[Drawing 2]The lineblock diagram showing one example of this invention.
[Drawing 3]A flow chart same as the above.
[Drawing 4]The flow chart which shows other portions of drawing 3.
[Drawing 5]The figure for explaining an operation same as the above.
[Drawing 6]Other figures for explaining an operation same as the above.
[Description of Notations]
2 Flueway
6 The 1st filter
7 The 1st heater
9 The 1st control valve
12 The 2nd filter
13 The 2nd heater
15 The 2nd control valve
17 Control device

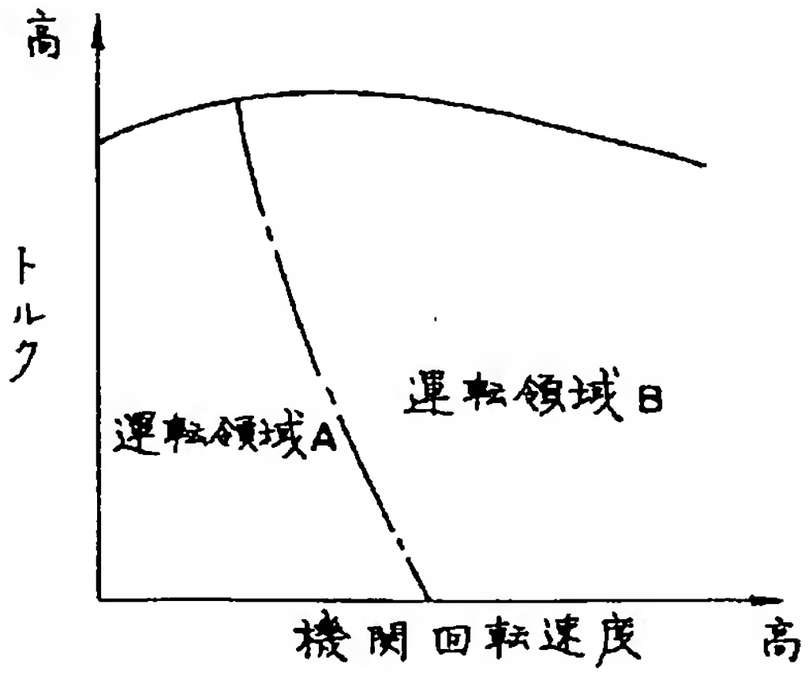
[Translation done.]

DRAWINGS

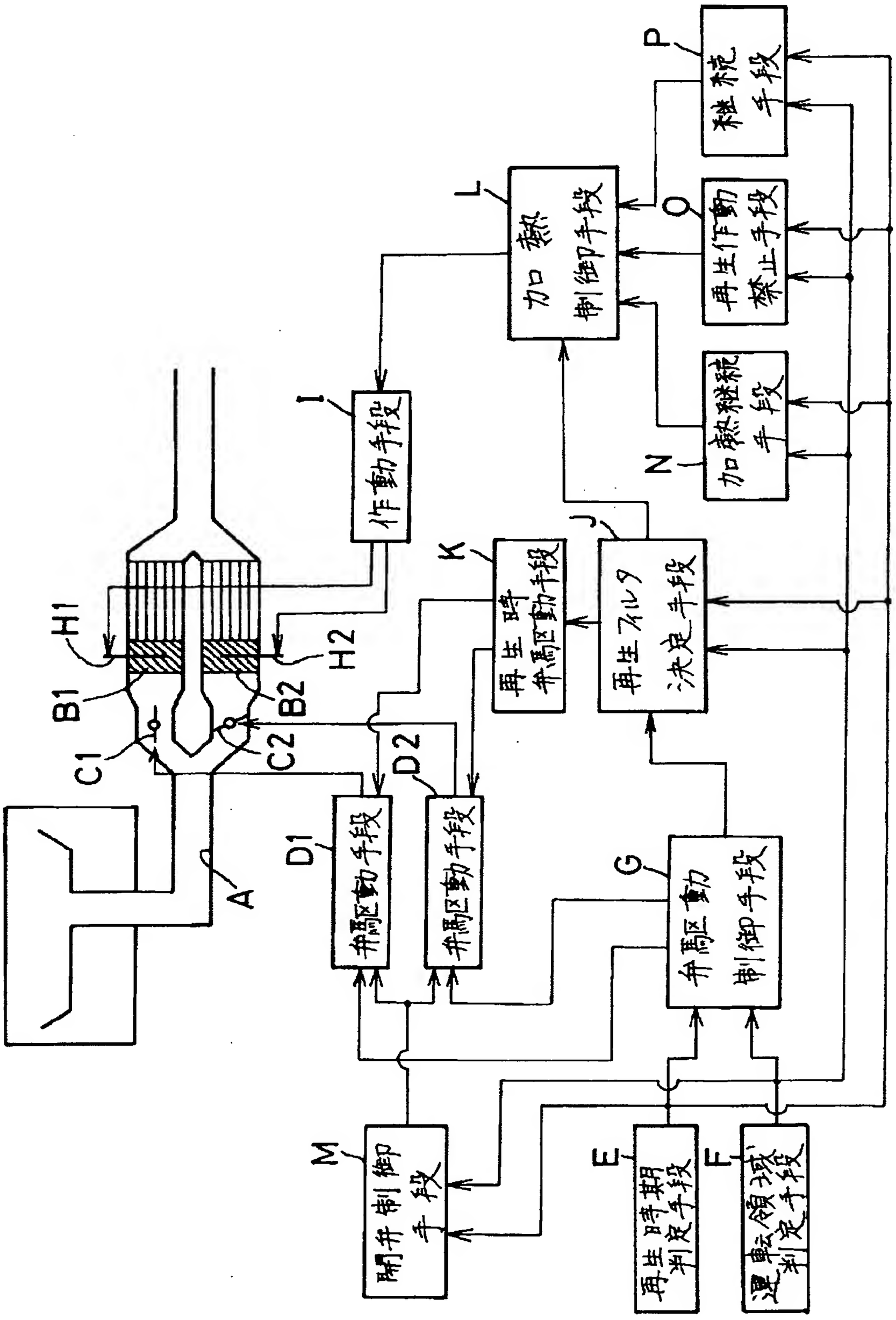
[Drawing 4]



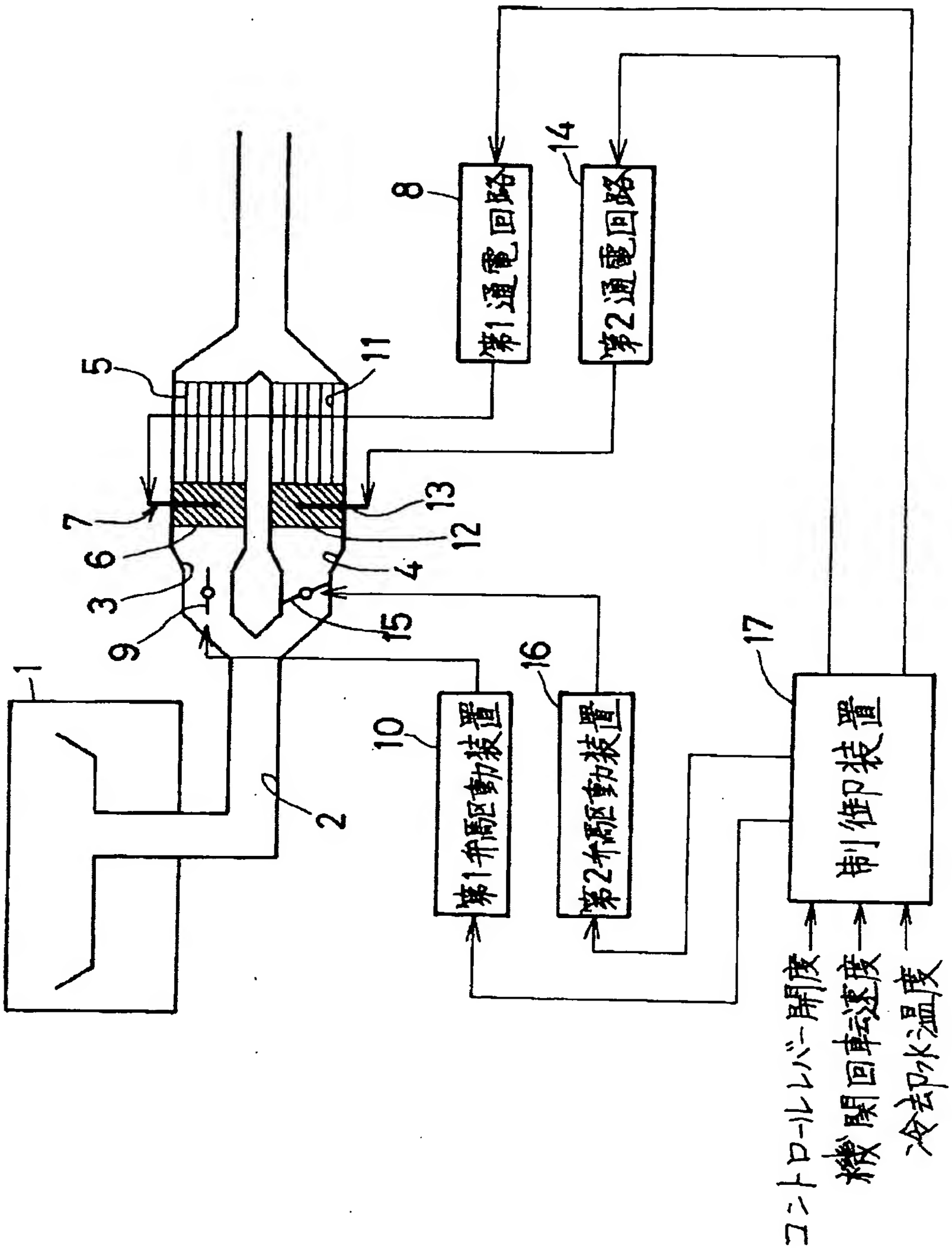
[Drawing 5]



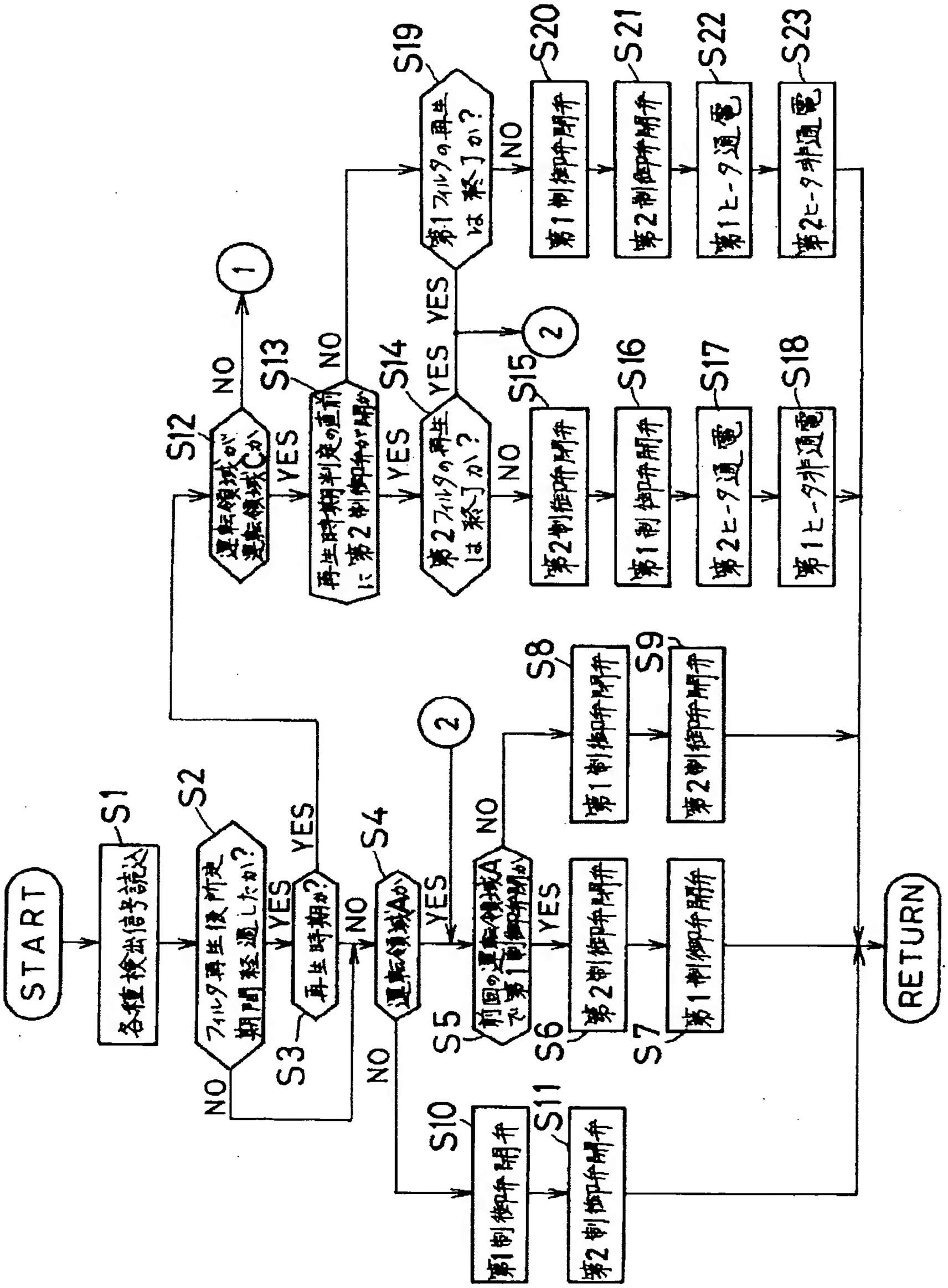
[Drawing 1]


I
作動手段
L
加熱制御手段
P
継続手段
O
再生作動禁止手段
N
加熱継続手段
K
再生時弁開区動手段
J
再生フィルタ決定手段
G
弁開区動制御手段
D1
弁開区動手段
D2
弁開区動手段
M
開弁制御手段
E
再生時期判定手段
F
運転領域判定手段
H1
H2
B1
B2
C1
C2
A

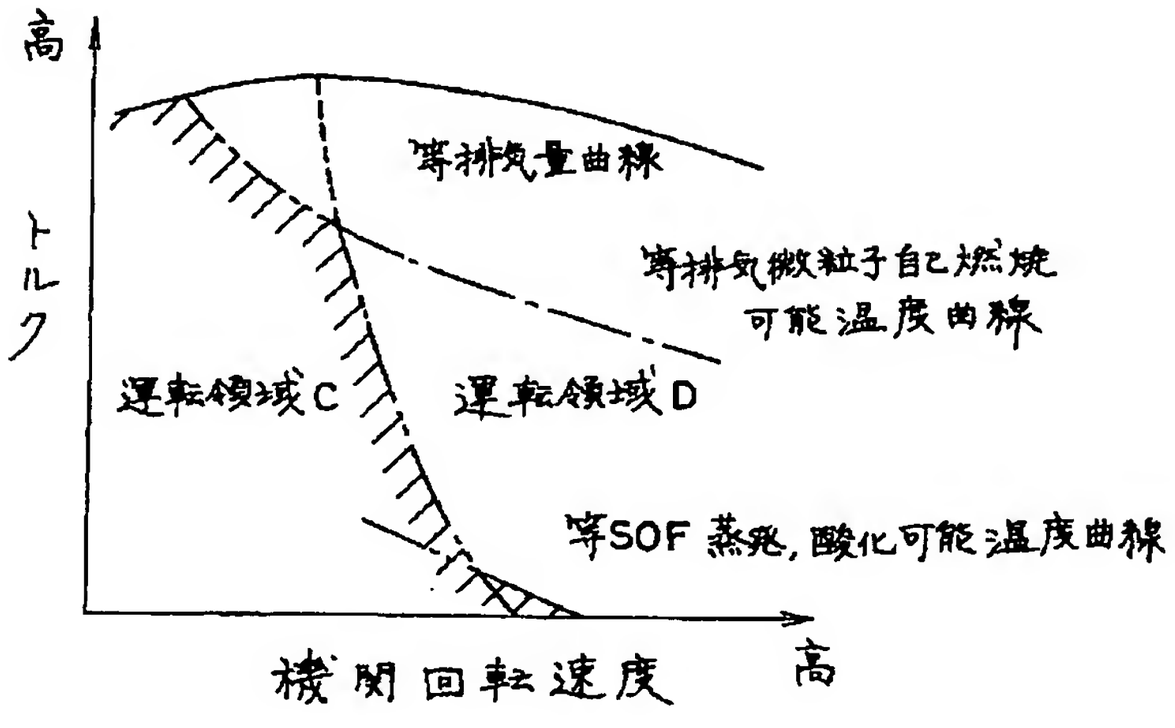
[Drawing 2]


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
第1通電回路
第2通電回路
第1補助駆動装置
第2補助駆動装置
制御装置
トロールレバー開度
機関回転速度
冷却水温度

[Drawing 3]


START
S1
各種検出信号読込
S2
フィルタ再生後所定期間経過したか?
NO
YES
S3
再生時期か?
YES
NO
S4
運転領域Aか
YES
NO
S5
前回の運転領域Aで第1制御弁開弁か
YES
NO
S6
第2制御弁開弁
S7
第1制御弁開弁
S8
第1制御弁開弁
S9
第2制御弁開弁
S10
第1制御弁開弁
S11
第2制御弁開弁
RETURN
1
2
S12
運転領域Cか
YES
NO
S13
再生時期判定の直前に第2制御弁が開弁か
YES
NO
S14
第2フィルタの再生は終了か?
YES
NO
S15
第2制御弁開弁
S16
第1制御弁開弁
S17
第2ヒータ通電
S18
第1ヒータ非通電
S19
第1フィルタの再生は終了か?
YES
NO
S20
第1制御弁開弁
S21
第2制御弁開弁
S22
第1ヒータ通電
S23
第2ヒータ非通電

[Drawing 6]



[Translation done.]

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Ｆ０１Ｎ　3/02	３４１　Ａ Ｃ Ｐ			

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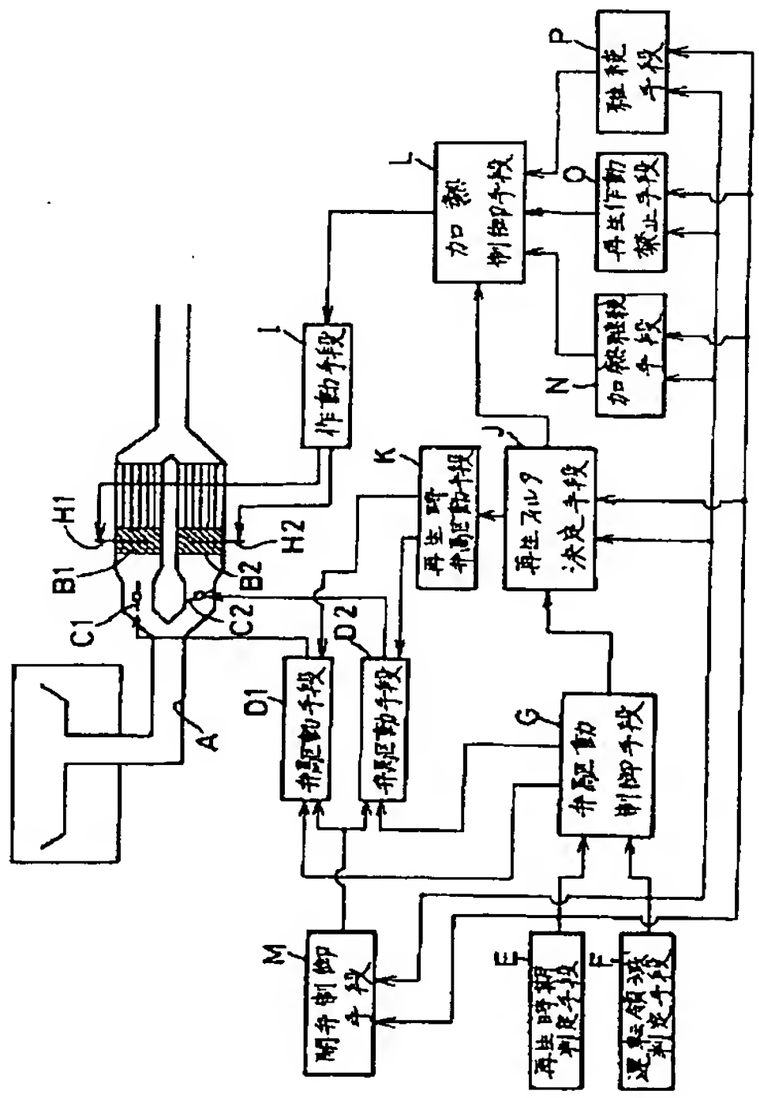
(54)【発明の名称】　内燃機関の排気浄化装置

(57)【要約】
【目的】　排気微粒子等の成分が大気中に放出されるのを防止しつつ排気浄化装置の小型化を図り、小型乗用車等にも排気浄化装置を搭載可能にする。
【構成】　フィルタＢ１，Ｂ２を排気通路Ａに並列に２つ配設すると共に各フィルタへの排気流れを制御する制御弁Ｃ１，Ｃ２を設け、各フィルタにヒータＨ１，Ｈ２を備える。そして、排気量が少ない運転域での捕集時には２つのフィルタＢ１，Ｂ２に排気を交互に導入し、排気量が多い運転域での捕集時には２つのフィルタＢ１，Ｂ２に排気を同時に導入する。また、排気量が少ない運転領域での再生時には再生時期判定時直前に制御弁が開いている側のフィルタＢ１，Ｂ２をヒータＨ１，Ｈ２への通電により再生し、排気量が多い運転域では両フィルタＢ１，Ｂ２に排気を同時に導入して再生する。



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【特許請求の範囲】

【請求項１】機関排気通路に並列に介装され排気微粒子を捕集する複数のフィルタと、該フィルタ毎若しくは所定のフィルタ群毎に設けられフィルタへの排気流れを制御する複数の排気流制御弁と、これら排気流制御弁を夫々開閉駆動する弁駆動手段と、前記フィルタの再生時期を判定する再生時期判定手段と、機関運転状態に基づいて排気量に対応する運転領域を判定する運転領域判定手段と、前記フィルタの非再生時期と判定されかつ排気量が少ない運転領域と判定されたときに前記フィルタ若しくは所定のフィルタ群に排気を交互に導入させ、前記フィルタの非再生時期と判定されかつ排気量が多い運転領域と判定されたときに全てのフィルタに導入させるべく前記弁駆動手段を介して前記排気流制御弁を駆動制御する駆動制御手段と、を備えたことを特徴とする内燃機関の排気浄化装置。

【請求項２】フィルタ毎若しくは所定のフィルタ群毎に設けられフィルタを加熱する複数の加熱手段と、これら加熱手段を作動させる作動手段と、再生時期と判定されかつ排気量が少ない運転領域と排気されたときに、再生時期と判定される直前の排気流制御弁の開閉状態に基づいて再生すべきフィルタ若しくはフィルタ群を決定する再生フィルタ決定手段と、決定されたフィルタ若しくはフィルタ群の加熱手段を作動手段を介して加熱作動させる加熱制御手段と、を備えてなる請求項１記載の内燃機関の排気浄化装置。

【請求項３】再生フィルタ決定手段は再生時期と判定される直前に排気流制御弁が開弁されているフィルタ若しくはフィルタ群を再生すべきフィルタ若しくはフィルタ群として決定し、かつ決定されたフィルタ若しくはフィルタ群の排気流制御弁を閉弁駆動させる一方再生時期と判定される直前に閉弁されている残りの排気流制御弁を開弁駆動する再生時弁駆動手段を備えてなる請求項２記載の内燃機関の排気浄化装置。

【請求項４】再生時期と判定され、かつ排気量が多い若しくは排気温度が高い運転領域と判定されたときに全てのフィルタ若しくはフィルタ群に排気を流入させて再生を行うべくそれらのフィルタ若しくはフィルタ群の排気制御弁を開弁駆動させる開弁制御手段を、備えてなる請求項２記載の内燃機関の排気浄化装置。

【請求項５】再生フィルタ決定手段により決定されたフィルタ若しくはフィルタ群の再生が終了するまでの期間それらフィルタを加熱する加熱手段の作動を継続させる加熱継続手段と、フィルタ若しくはフィルタ群の再生が終了したときから所定期間経過するまでは他のフィルタ若しくはフィルタ群の再生作動を禁止させる再生作動禁止手段と、を備えてなる請求項２または請求項３記載の内燃機関の排気浄化装置。

【請求項６】所定のフィルタ若しくはフィルタ群を加熱手段を作動させて再生を行っているときに排気量が多い若しくは排気温度が高い運転領域に入ったときに、前記運転領域に入ったときから所定期間の間前記加熱手段の作動を継続させる継続手段を、備えてなる請求項３記載の内燃機関の排気浄化装置。

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【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、内燃機関の排気浄化装置に関する。

【０００２】

【従来の技術】内燃機関の排気浄化装置の従来例として、特開昭６３－１３４８０８号公報に示すようなものがある。このものは、機関の排気通路に排気中の微粒子を捕集するトラップを介装すると共に、トラップをバイパスするバイパス通路を形成するようにしている。そして、トラップの再生時期と判定されたときにトラップ入口部のヒータに通電し、トラップ入口温度が所定温度以上になるとトラップ入口のバルブを所定開度まで閉駆動させ残りの排気はバイパス通路を流通させる。そして、トラップの入口側及び出口側に配設された酸素濃度センサの相対的な酸素濃度差が所定値以下になったときに、再生が終了したと判断しヒータへの通電を停止させると共に前記バルブを全開駆動させる。

【０００３】また、特開昭５９－８５４１７号公報のものは、再生時期と判定されたときに排気をバイパス通路に流通させてトラップの再生を行うと共にトラップ再生開始がらの経過時間により再生終了時期を判定しトラップの再生を終了させるようにしている。また、特開昭５９－２０５１５号公報のものは、トラップの再生時に排気をバイパス通路に流通させると共に、トラップの出口温度が所定温度以上になったときに再生終了時と判定し、トラップの再生を終了させるようにしている。

【０００４】

【発明が解決しようとする課題】しかしながら、このような従来の排気浄化装置においては、トラップの再生中には排気の大部分をバイパス通路を介して大気中に排出するようにしているので、再生中に機関運転状態が変化（例えば負荷が変化）し機関から排出される排気成分が悪化（例えばスモークが可視状態になる）してもそれ対応できず排気をそのまま大気中に放出するという不具合がある。

【０００５】このため、近年、特開平１－２３２１０５号公報，実開平３－２７８２０号公報等において、トラップを排気通路に並列に介装し、一方のトラップの再生中には他方のトラップに排気を流通させ、再生と捕集とを交互に切換えて行うものが提案されている。しかし、これらのものではいずれかのトラップを排気は単に流通するので再生中においても大気中に放出される排気成分は悪化しないが、トラップを並列に配設しているため、システム全体が大型化し車両への搭載が難しくなるという不具合がある（それを排気系に配管するためには車両

の床形状等を大幅に変更する必要がある）。かかる不具合は特に小形乗用車等の床下スペースが制約されるものにおいては、トラップを並列に配設し、それを捕集側と再生側とに交互に排気流を切換えることは困難である。

【０００６】本発明は、このような実状に鑑みてなされたもので、排気微粒子等の成分の大気中への放出を防止しつつ排気浄化装置の小型化を図り、小型乗用車等においても排気浄化装置に搭載できるようにすることを目的とする。

【０００７】

【課題を解決するための手段】このため、本発明は、請求項１においては、図１に示すように、機関排気通路Ａに並列に介装され排気微粒子を捕集する複数のフィルタＢ１，Ｂ２と、該フィルタ毎若しくは所定のフィルタ群毎に設けられフィルタへの排気流れを制御する複数の排気流制御弁Ｃ１，Ｃ２と、これら排気流制御弁Ｃ１，Ｃ２を夫々開閉駆動する弁駆動手段Ｄ１，Ｄ２と、、前記フィルタの再生時期を判定する再生時期判定手段Ｅと、機関運転状態に基づいて排気量に対応する運転領域を判定する運転領域判定手段Ｆと、前記フィルタの非再生時期と判定されかつ排気量が少ない運転領域と判定されたときに前記フィルタ若しくは所定のフィルタ群に排気を交互に導入させ前記フィルタの非再生時期と判定されかつ排気量が多い運転領域と判定されたときに全てのフィルタに導入されるべく前記駆動手段Ｄ１，Ｄ２を介して前記排気流制御弁Ｃ１，Ｃ２を駆動制御する弁駆動制御手段Ｇと、を備えるようにした。

【０００８】また、請求項２においては、請求項１に加えて、図１に示すように、フィルタ毎若しくは所定のフィルタ群毎に設けられフィルタを加熱する加熱手段Ｈ１，Ｈ２と、これら加熱手段を作動させる作動手段Ｉと、再生時期と判定されかつ排気量が少ない運転領域と判定されたときに、再生時期と判定される直前の排気流制御弁Ｃ１，Ｃ２の開閉状態に基づいて再生すべきフィルタ若しくはフィルタ群を決定する再生フィルタ決定手段Ｊと、決定されたフィルタ若しくはフィルタ群の加熱手段Ｅ１，Ｅ２を作動手段Ｉを介して加熱作動させる加熱制御手段Ｋと、を備えるようにした。

【０００９】また、請求項３においては、請求項２における再生フィルタ決定手段Ｊは再生時期と判定される直前に排気流制御弁Ｃ１，Ｃ１が開弁されているフィルタ若しくはフィルタ群を再生すべきフィルタ若しくはフィルタ群として決定し、かつ決定されたフィルタ若しくはフィルタ群の排気流制御弁Ｃ1，Ｃ２を閉弁駆動させる一方再生時期と判定される直前に閉弁している残りの排気流制御弁を開弁駆動する再生時弁駆動手段Ｋを備えるようにした。

【００１０】また、請求項４においては、請求項２に加えて、図１に示すように再生時期と判定され、かつ排気量が多い若しくは排気温度が高い運転領域と判定されたときに全てのフィルタ若しくはフィルタ群に排気を流入させるべく排気流制御弁Ｃ１，Ｃ２を開弁駆動させる開弁制御手段Ｍを、備えるようにした。また、請求項５においては、請求項２または請求項３に加えて、再生フィルタ決定手段Ｊにより決定されたフィルタ若しくはフィルタ群の再生が終了するまでの期間それらを加熱する加熱手段Ｅ１，Ｅ２の作動を継続させる加熱継続手段Ｎと、フィルタ若しくはフィルタ群の再生が終了したときから所定期間経過するまでは他のフィルタ若しくはフィルタ群の再生作動を禁止させる再生作動禁止手段Ｏと、を備えるようにした。

【００１１】さらに、請求項６においては、請求項３に加えて、所定のフィルタ若しくはフィルタ群を加熱手段Ｅ１，Ｅ２を作動させて再生を行っているときに排気量が多い若しくは排気温度が高い運転領域に入ったときに、前記運転領域に入ったときから所定期間の間前記加熱手段Ｅ１，Ｅ２の作動を継続させる継続手段Ｐを、備えるようにした。

【００１２】

【作用】そして、請求項１においては、機関吸気通路にフィルタを並列に複数配設すると共に、フィルタ毎若しくは所定のフィルタ群毎にフィルタへの排気流れを制御する排気流制御弁を設け、排気量が少ない運転領域における排気微粒子捕集時にはフィルタ若しくはフィルタ群毎に切換えて排気をフィルタに導入させる一方、排気量が多い運転領域における排気微粒子捕集時には全てのフィルタ若しくはフィルタ群に排気を流すことにより、排気微粒子の大気中への放出を防止しつつ排気量の増大に対応させてフィルタ容量を増大できるためフィルタの全容量の小型化を図れ、また各フィルタに排気微粒子を略同様に捕集し再生処理を容易ならしめるようにした。

【００１３】また、請求項２においては、再生時期判定時に排気量が少ない運転領域のときには、再生時期判定直前の排気流制御弁の開閉状態に基づいて再生すべきフィルタ若しくはフィルタ群を決定して加熱手段を作動させ、フィルタの再生を最適な時期に行えるようにした。その具体的構成として請求項３において、再生時期判定直前に排気流請求項弁が開弁されているフィルタ若しくはフィルタ群を再生すべきと決定すると共にそれらの排気流制御弁を閉弁駆動する一方再生時期判定時に閉弁されている排気流制御弁を開弁駆動しフィルタの温度が高い最適時期に再生を行えるようにし、再生時間を短縮できるようにした。

【００１４】また、請求項４においては、再生判定時に排気量が多い若しくは排気温度が高い運転領域では全てのフィルタ若しくはフィルタ群に排気を流入させて再生を行い、排気微粒子の大気中への放出を防止すると共に排圧上昇を抑制しつつこれによっても排気量の増大に対応させてフィルタ容量を増大させフィルタの全容量の小型化を図れるようにした。

【００１５】また、請求項５においては、排気量が少ない運転領域での再生時には再生が終了するまで加熱手段を作動させて再生を良好でかつ短時間で行えるようにし、また再生が終了したときから所定期間経過するまでは他のフィルタ若しくはフィルタ群の再生作動を禁止させて加熱手段に電気ヒータを用いたときにバッテリ等の電力供給系の負担を軽減できるようにした。

【００１６】さらに、請求項６においては、排気量の少ない運転領域での再生時に排気量の多い若しくは排気温度が高い運転領域に入ったときには、その運転領域に入ったときから所定時間の間加熱手段の作動を継続させることにより、再度排気量の少ない運転領域に入ったときに加熱手段として電気ヒータを用いたときに突入電流による電力供給系への負担を軽減させて再生を最適に行うようにした。

【００１７】

【実施例】以下に、本発明の一実施例を図２～図６に基づいて説明する。図２においてディーゼル機関１の排気通路２は途中で分岐されて第１分岐通路３と第２分岐通路４とが形成されている。前記第１分岐通路３にはハニカム状の第１触媒装置５が介装され、第１触媒装置５上流の第１分岐通路３には排気微粒子を捕集する第１フィルタ６が介装されている。前記第１フィルタ６には加熱手段としての第１ヒータ７が挿入され、第１ヒータ７には作動手段としての第１通電回路８から通電される。前記第１フィルタ６上流の第１分岐通路３には排気流制御弁としての第１制御弁９が介装され、第１制御弁９は弁駆動手段としてのステップモータ等の第１駆動装置１０により開閉駆動される。

【００１８】一方、前記第２分岐通路４にはハニカム状の第２触媒装置１１が介装され、第２触媒装置１１上流の第２分岐通路４には排気微粒子を捕集する第２フィルタ１２が介装されている。前記第２フィルタ１２には加熱手段としての第２ヒータ１３が挿入され、第２ヒータ１３には作動手段としての第２通電回路１４から通電される。前記第２フィルタ１２上流の第２分岐通路４には排気流制御弁としての第２制御弁１５が介装され、第２制御弁１５は弁駆動手段としてのステップモータ等の第２弁駆動装置１６により開閉駆動される。

【００１９】前記第１及び第２通電回路８，１４はマイクロコンピュータ等からなる制御装置１７により駆動制御され第１及び第２ヒータ７，１３への通電制御を行う。また、第１及び第２駆動弁装置１０，１６は前記制御装置１７により駆動制御され第１及び第２制御弁９，１５を開閉制御する。前記制御装置１７には燃料噴射ポンプ（図示せず）のコントロールレバー開度（又はアクセル開度），機関運転速度，冷却水温度等の各種検出信号が入力されている。

【００２０】ここでは、制御装置１７が後述の如く再生時期判定手段と運転領域判定手段と開弁制御手段と弁駆動制御手段と再生フィルタ決定手段と再生時弁駆動手段と加熱制御手段と加熱継続手段と再生作動禁止手段と継続手段とを構成する。次に、作用を図３及び図４のフローチャートに従って説明する。Ｓ１では、アクセル開度，機関回転速度等の各種検出信号を読込む。

【００２１】Ｓ２では、第１フィルタ６若しくは第２フィルタ１２の前回の再生終了時から所定期間経過したか否かを判定し、ＹＥＳのときにはＳ３に進みＮＯのときにはＳ３を通過することなくＳ４に進む。Ｓ３では、第１フィルタ６及び第２フィルタ１２の再生時期か否かを判定し、ＹＥＳのときにはＳ１２に進みＮＯのときにはＳ４に進む。したがって、この部分が請求項１の再生時期判定手段を構成する。ここで、再生時期の判定は、例えばディーゼル機関から排出される排気微粒子量（機関の運転状態から判断できる）とフィルタの捕集効率との積（フィルタに捕集される排気微粒子量）を加算した値によって判断されるものであり、本装置では第１及び第２フィルタ６，１２の両方が再生を終了するまでは再生時期と判定されるようになっている。また、Ｓ２において、第１フィルタ６または第２フィルタ１２の前回の再生終了時から所定期間経過したかの有無を判定するのは、第１フィルタ６と第２フィルタ１２との再生を継続して行うと、電力供給系の負担が増すため一方のフィルタの再生終了後所定期間再生作動を停止させるようにしたものである。これにより、再生時に消耗した電力供給系の充電を確実に行わせ、再生後の再始動時等に機関を確実に始動できるようにしたものである。したがって、Ｓ２の部分が請求項５の再生作動禁止手段を構成する。

【００２２】Ｓ４では、検出されたコントロールレバー開度と機関回転速度とに基づいて、機関の運転領域が排気量の少ない運転領域Ａか否かを判定し、ＹＥＳのときにはＳ５に進みＮＯのときには排気量が多い運転領域Ｂと判断しＳ１０に進む。ここで、前記運転領域Ａ，Ｂは、図５に示すように機関回転速度とトルク（機関回転運転とコントロールレバー開度から決定できる）とに対応させて設定されており、運転領域Ａはトルクが高くなるに従って機関回転速度が低下するように設定されている。したがって、この部分が運転領域判定手段を構成する。

【００２３】Ｓ５では、前回の運転領域Ａで第１制御弁９を閉弁させたか否かを判定し、ＹＥＳのときにはＳ６に進みＮＯのときにはＳ８に進む。そして、Ｓ６では、第２制御弁１５を第２弁駆動装置１６を介して閉弁駆動すると共にＳ７では第１制御弁９を第１弁駆動装置１０を介して開弁駆動させる。一方、Ｓ８では第１制御弁９を第１弁駆動装置１０を介して閉弁駆動すると共にＳ９では第２制御弁１５を第２弁駆動装置１６を介して開弁駆動する。

【００２４】これにより、排気量が少ない運転領域Ａでは、第１制御弁９と第２制御弁１５とが交互に切換えて

開閉駆動されるので、第１フィルタ６と第２フィルタ１２とに排気が交互に導入され各フィルタ６，１２に略同量の排気微粒子を捕集できる。一方、Ｓ４において運転領域が排気量の多い運転領域Ｂと判定されたときには、Ｓ１０において第１制御弁９を開弁させると共にＳ１１において第２制御弁１５を開弁させる。これにより、運転領域Ｂにおいては、第１及び第２制御弁９，１５が共に開弁されるので、第１フィルタ６と第２フィルタ１２に排気が同時でかつ略同量流入するため、第１及び第２フィルタ６，１２において略同量の排気微粒子が捕集される。

【００２５】したがって、Ｓ６～Ｓ１１が弁駆動手段を構成する。これにより、排気温度が高い運転領域Ｂから運転領域Ａに入る毎に一方のフィルタ６，１２への排気が遮断されるので、フィルタ６，１２の一方と第１及び第２触媒装置５，１１の一方が保温される。このため、一方のフィルタ６，１２に付着したＳＯＦ（有機溶媒に可溶な物質）の蒸発と一方の触媒装置５，１１でのＳＯＦの酸化とを良好に維持できるので、フィルタへのＳＯＦ付着量を減少でき再生間隔を延長できるばかりでなく排気浄化状態を良好にでき排気性状を良好にできる。ここで、運転領域Ａでも両フィルタ６，１２に排気を同時に流すように構成すると、フィルタ内での排気流速が低下するので、離脱し易い状態でフィルタに付着する排気微粒子量が増大するため、排気流速が速い加速運転等にフィルタから排気微粒子が離脱し大気中に排出される不具合があるばかりでなく、運転領域Ａ内ではＳＯＦの蒸発及び触媒での酸化が殆どできなくなり再生間隔が短くなると共に排気性状を悪化させるが、フィルタ６，１２に排気を交互に導入させると排気流速が速くなるため排気微粒子が離脱し易い状態でフィルタに捕集されることがなく加速運転時等に排気微粒子が大気中に放出されるのを防止できると共にＳＯＦの蒸発及び触媒での酸化を促進でき再生間隔を延長できるばかりでなく排気性状を良好にできるのである。。

【００２６】尚、排気微粒子捕集時には第１及び第２ヒータ７，１３は非通電状態に維持される。一方、Ｓ３において再生時期と判定されたときには、Ｓ１２において、検出されたコントロールレバー開度と機関回転速度とに基づいて運転領域が運転領域Ｃか否かを判定し、ＹＥＳのときにはＳ１３に進みＮＯのときには運転領域が運転領域Ｄと判断し図４のＳ２４に進む。ここで、前記運転領域Ｃ，Ｄは図６に示すように機関回転速度とトルクとに対応させて設定されており、運転領域Ｃはトルクが高くなるに従って機関回転速度が低下するように設定されている。また、運転領域Ｃは、図６に示すように、排気量が所定値より少ない領域でかつ排気温度が排気微粒子を自己燃焼可能な温度より低い領域若しくはＳＯＦの蒸発，酸化可能な排気温度より低い運転領域に設定されている。また、運転領域Ｄは、図６に示すように、排

気量が所定値より多く排気温度が高い領域でかつＳＯＦの蒸発，酸化可能な排気温度より高い領域若しくは排気温度が排気微粒子の自己燃焼可能な温度より高い領域に設定されている。

【００２７】Ｓ１３では、再生時期と判定される直前には第２制御弁１５が開弁していたか否かを判定し、ＹＥＳのときには第２フィルタ１２を再生すべきと判断しＳ１４に進みＮＯのときには第１制御弁９が開弁していたと判断しＳ１９に進む。したがって、この部分が請求項２における再生フィルタ決定手段を構成する。Ｓ１４では、第２制御弁１５側の第２フィルタ１２の再生が終了したか否かを判定し、ＮＯのときには再生を行うべくＳ１５に進み、ＹＥＳのときには前記Ｓ５に戻り排気微粒子の捕集状態での制御が前記Ｓ１３において再生時期判定直前の開弁状態が第２制御弁１５と判定されるまで行われる。この判定は、前記Ｓ３において第１及び第２フィルタ６，１２が共に再生を終了しない限り再生時期の判定が解除されないので、第２フィルタ１２の再生が終了した状態で再度第２フィルタ１２の再生操作を行わないようにするために、行うものである。

【００２８】そして、第２フィルタ１２の再生が終了していないと判定されたときには、Ｓ１５では、第２制御弁１５を閉弁駆動すると共にＳ１６では第１制御弁９を開弁駆動する。したがって、この部分が再生時弁駆動手段を構成する。また、Ｓ１７では第２通電回路１４を作動させて第２ヒータ１３に通電し第２フィルタ１２を加熱する一方、Ｓ１８では第１通電回路８の作動を停止させ第１ヒータ７への通電を停止させ、第２フィルタ１２の再生を開始させる。ここで、かかる操作を行うのは、再生時期判定直前に第２制御弁１５が開弁しているときには再生時に第２制御弁１５を閉弁した方が第２フィルタ１２及び第２触媒装置１１を高温に保持できる可能性が高く、第２ヒータ１２の通電開始時から第２フィルタ１２が所定温度にまで上昇する時間が短縮できるためである。尚、再生時期判定前に、かなり長期間低負荷運転状態で第２フィルタ１２に排気を流通させるときには、第２制御弁１５を閉弁して第２フィルタ１２への排気流れを遮断しても第２フィルタ１２を高温に保持できないが、排気が遮断されている第１フィルタ６よりも第２フィルタ１２の温度が高くなっていると共に離脱し易い状態の排気微粒子が多く第２フィルタ１２に捕集されているため、再生時期判定直前に第２制御弁１５が開弁している第２フィルタ１２から再生を行うのが有利である。

【００２９】一方、Ｓ１３においては第１制御弁９が開弁していると判定されたときには、Ｓ１９において、第１制御弁９側の第１フィルタ６の再生が終了したか否かを判定し、ＹＥＳのときにはＳ５に戻りＮＯのときにはＳ２０に進む。そして、Ｓ２０では第１制御弁９を閉弁駆動すると共にＳ２１では第２制御弁１２を開弁駆動する。また、Ｓ２２では第１通電回路８を作動させて第１

ヒータ７に通電し第１フィルタ６を加熱する一方、Ｓ２３では第２通電回路１４の作動を停止させ第２ヒータ１２への通電を停止させ、第１フィルタ６の再生を開始させる。したがって、前記Ｓ１３とＳ２０との部分が請求項３の再生フィルタ決定手段を構成する。また、Ｓ１７，Ｓ１９，Ｓ２２．Ｓ２３の部分が請求項２における加熱制御手段を構成し、Ｓ１７及びＳ２２の部分が請求項５の加熱継続手段を構成する。

【００３０】また、再生時期と判定されかつ運転領域が運転領域Ｄにあると判定されたときには、図４のＳ２４において第１制御弁９を開弁させると共にＳ２５において第２制御弁１２を開弁させて両フィルタ６，１２に排気を流通させ、Ｓ２６に進む。したがって、Ｓ２４及びＳ２５が請求項４における開弁制御手段を構成する。Ｓ２６では、運転領域Ｄにはいってから所定期間経過したか否かを判定し、ＹＥＳのときにはＳ２７に進みＮＯのときにはＳ２９に進む。

【００３１】そして、運転領域Ｄに入ってから所定期間経過したと判定されたときには、Ｓ２７において第１ヒータ７への通電を停止させると共に、Ｓ２８において第２ヒータ１３への通電を停止させる。一方、運転領域Ｄに入ってから所定期間未満のときには、Ｓ２９において第１ヒータ７若しくは第２ヒータ１３への通電を継続させる。したがって、この部分が請求項６の継続手段を構成する。

【００３２】これは、運転領域Ｄに入ってすぐにヒータへの通電を停止させると、前記運転領域Ｃにすぐに戻ったときに再度ヒータに通電を行う必要がありヒータへの突入電流の影響によって逆に電力供給系の負担が増大するので、所定期間経過してからヒータへの通電を停止させるようにした。以上説明したように、第１フィルタ６と第２フィルタ１２を並列に配列し、排気微粒子捕集時に、排気量が少ない運転領域では一方のフィルタ６，１２に排気を流通させ排気量が多い運転領域では両フィルタ６，１２に排気を流通させるようにしたので、排気微粒子の大気中への放出を防止しつつ排気量の増大に対応させてフィルタ容量を増大できるためフィルタの全容量を従来よりも小さくでき、排気浄化装置の小型化を図れ小型乗用車等に搭載可能となる。また、捕集時に、排気量が少ないときには第１フィルタ６と第２フィルタ１２とに交互に排気を流し排気量が多いときには両フィルタ６，１２に排気を流すようにしたので、両フィルタに略同量の排気微粒子を捕集できるため、フィルタを並列に配置した構成でもフィルタ毎に捕集量を計算することなく全体で捕集量を計算し再生時期を簡易に判断できるというメリットを有する。

【００３３】これは、運転履歴法による再生時期判定のときには判定ロジックを簡易化できるメリットであり、差圧等を検出するときにはセンサの数を削減できるメリットである。また、排気量が少ない運転領域では一方の

フィルタに排気を流すようにしているので、排気流速の低下を防止できるためフィルタに排気微粒子を離脱しやすい状態で捕集されることが少なく、加速時等での排気微粒子のブローオフを抑制できる。ここで、排気量が少なく排気流速が遅いときにはフィルタに捕集された排気微粒子に排気微粒子が付着する形態での排気微粒子の捕集が加わるため、見掛け上の捕集効率は高くなるが、このようにして捕集された排気微粒子は離脱し易く加速時等に大気中に一時に放出され車両の捕集効率には貢献しないのである。さらに、排気量の多い領域から排気量の少ない領域に入る毎に、一方のフィルタへの排気流れが遮断されるので、そのフィルタ及び触媒が保温され、ＳＯＦのフィルタにおける蒸発及び触媒でのＳＯＦの酸化を良好に維持できるため、フィルタへのＳＯＦの付着を減でき再生間隔を延長でき、また排気浄化を良好に維持でき、排気性状を向上できる。

【００３４】また、排気量の少ない運転領域での再生時には、再生判定直前に排気が流れている側の制御弁を閉弁させてフィルタ温度が高いうちにヒータに通電して再生するようにしたので、フィルタの昇温時間を短縮できヒータの電力供給系の負担を軽減できると共に再生時間を短縮できる。また、排気量が多い若しくは排気温度が高い領域の再生時には両フィルタ６，１２に排気を流すようにしたので、これによっても排気微粒子の大気中への放出を防止しつつフィルタ容量の小型化を図れると共に、排圧上昇を抑制でき排圧上昇に伴う排気性状の悪化を防止できる。

【００３５】また、排気量が少ない運転領域での再生時には再生が終了するまではヒータに通電するようにしたので、再生を良好でかつ短時間で行うことができる。また、再生が終了してから所定期間は他のフィルタの再生作動を禁止させるようにしたので、ヒータの電力供給系の負担を軽減できる。さらに、再生時に排気量が多い若しくは排気温度が高い運転領域に入ったときには、所定期間ヒータへの通電を継続させるようにしたので、再度ヒータへの直電域に入ったときのヒータへの再通電に伴う突入電流による電力供給系への負担を軽減できる。

【００３６】尚、本実施例では、フィルタが２つの場合を説明したが、フィルタが例えば４つの場合には４つのフィルタ毎に排気流制御弁を夫々設けてもよくまた２つのフィルタ（フィルタ群）毎に排気流制御弁を夫々設けるようにしてもよい。

【００３７】

【発明の効果】本発明は、以上説明したように、請求項１においては、フィルタを排気通路に複数並列に配設すると共に、フィルタ毎若しくはフィルタ群にフィルタへの排気流れを制御する排気流制御弁を設け、排気微粒子捕集時に排気量が少ない運転領域のときにはフィルタ若しくはフィルタ群に交互に排気を流す一方排気量が多い運転領域のときに全てのフィルタ若しくはフィルタ群に

排気を流すようにしたので、排気微粒子の大気中への放出を防止しつつフィルタを小型化でき小型乗用車等にも搭載可能となり、また再生時期の判断も簡易化できると共に再生間隔も延長できる。

【００３８】また、請求項２及び請求項３においては、排気量が少ない運転領域の再生時には、再生時期判定直前の排気流制御弁の開閉状態に基づいて再生すべきフィルタ若しくはフィルタ群を決定し、再生を行うようにしたので、請求項１の効果に加えて加熱手段の駆動エネルギ供給系の負担を軽減できる。また、請求項４においては、再生判定時に排気量が多い若しくは排気温度が高い運転領域では全てのフィルタ若しくはフィルタ群に排気を流して再生を行うようにしたので、請求項２の効果に加えて排圧上昇を抑制でき排圧上昇に伴う排気性状の悪化を防止できる。

【００３９】また、請求項５においては、排気量が少ない運転領域での再生時には再生が終了するまで加熱手段を作動させ、また再生終了時から所定期間は他のフィルタ若しくはフィルタ群の再生を禁止させるようにしたので、請求項２及び３の効果に加えて、再生を良好であつ短時間で行えると共に、加熱手段の駆動エネルギ供給系の負担を軽減できる。

＊【００４０】さらに、請求項６においては、再生中に排気量が多い若しくは排気温度が高い運転領域に入ったときには、所定期間加熱手段の作動を継続させるようにしたので、再度排気量の少ない運転領域に入ったときに駆動エネルギ供給系の負担を軽減させて再生を最適に行うことができる。

【図面の簡単な説明】

【図１】本発明のクレーム対応図。

【図２】本発明の一実施例を示す構成図。

【図３】同上のフローチャート。

【図４】図３の他の部分を示すフローチャート。

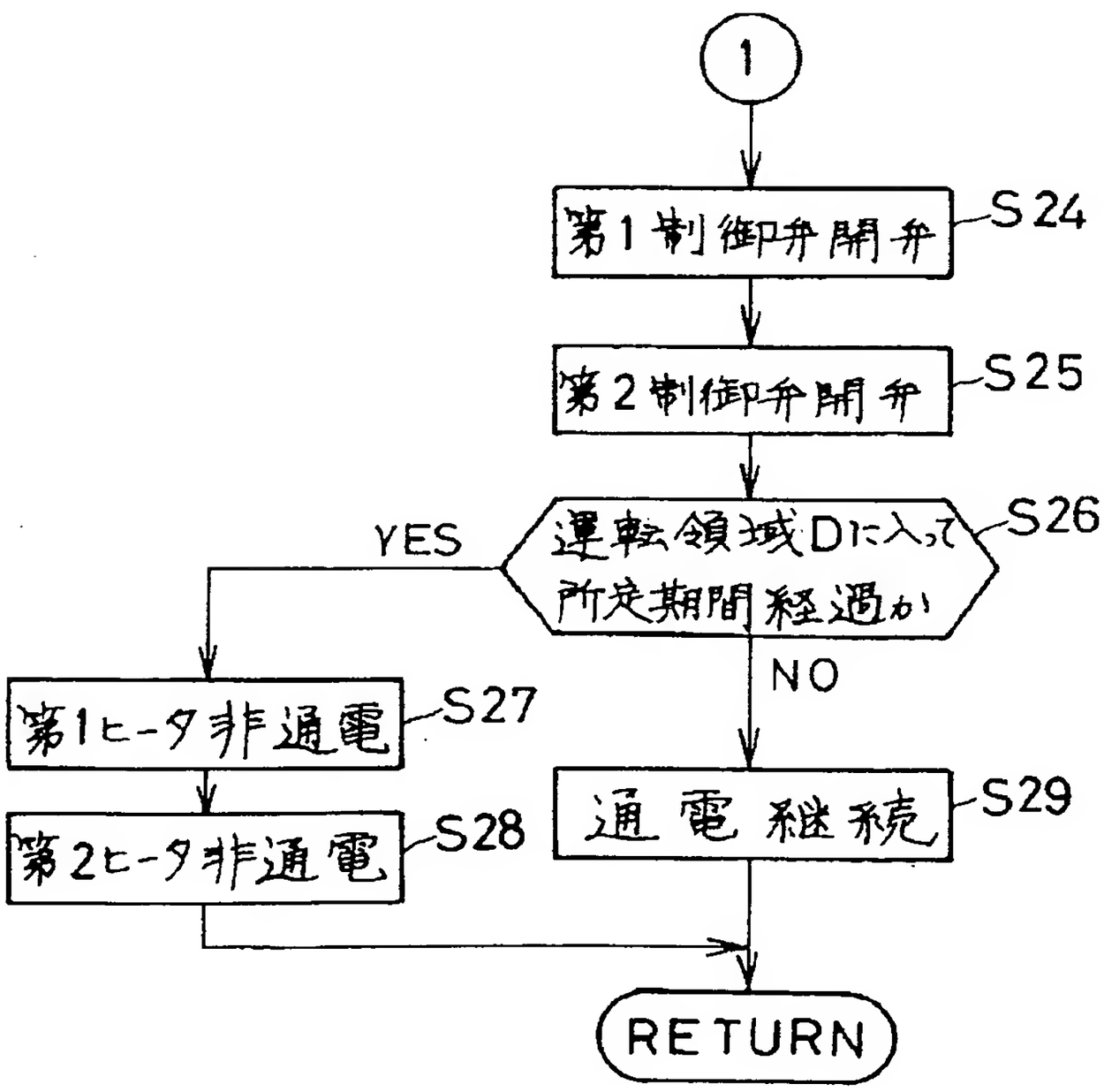
【図５】同上の作用を説明するための図。

【図６】同上の作用を説明するための他の図。

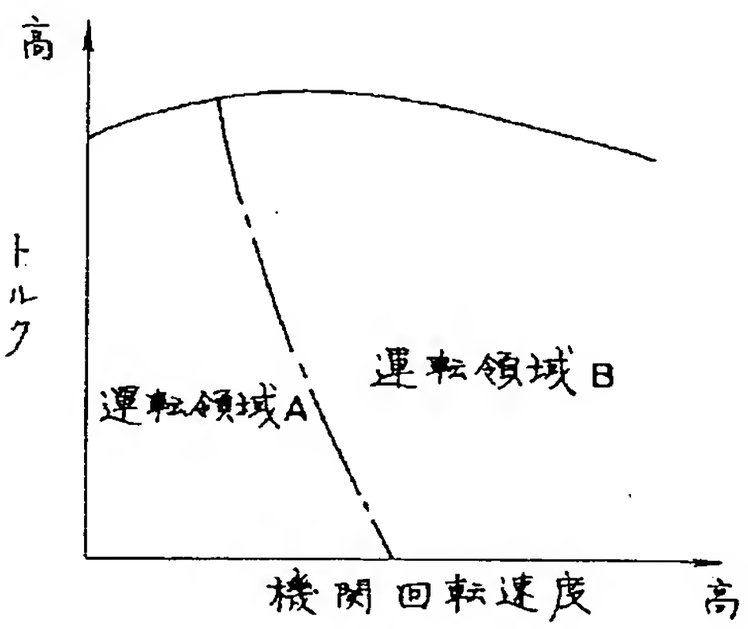
【符号の説明】

２　排気通路
６　第１フィルタ
７　第１ヒータ
９　第１制御弁
１２　第２フィルタ
１３　第２ヒータ
１５　第２制御弁
１７　制御装置

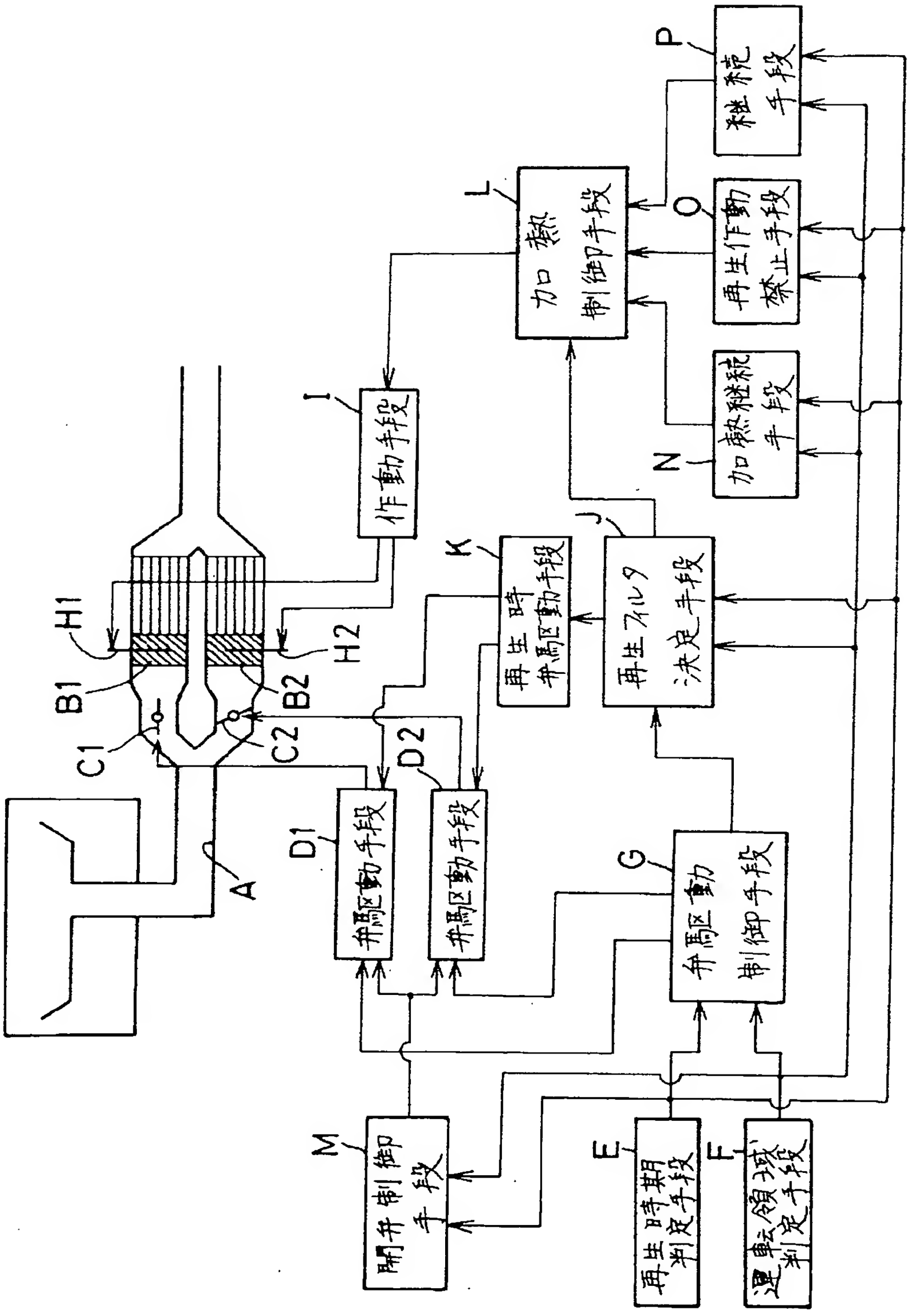
【図４】



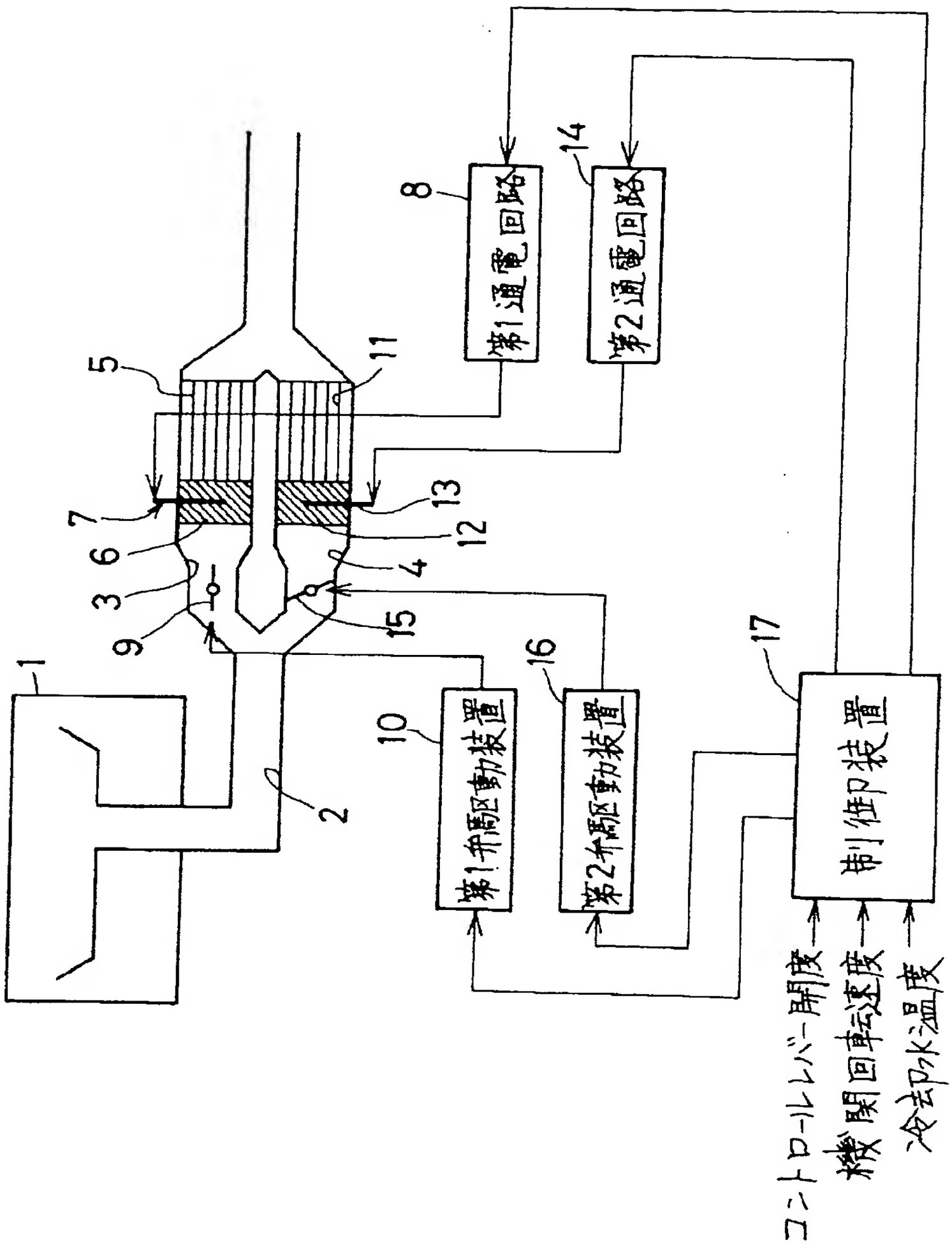
【図５】



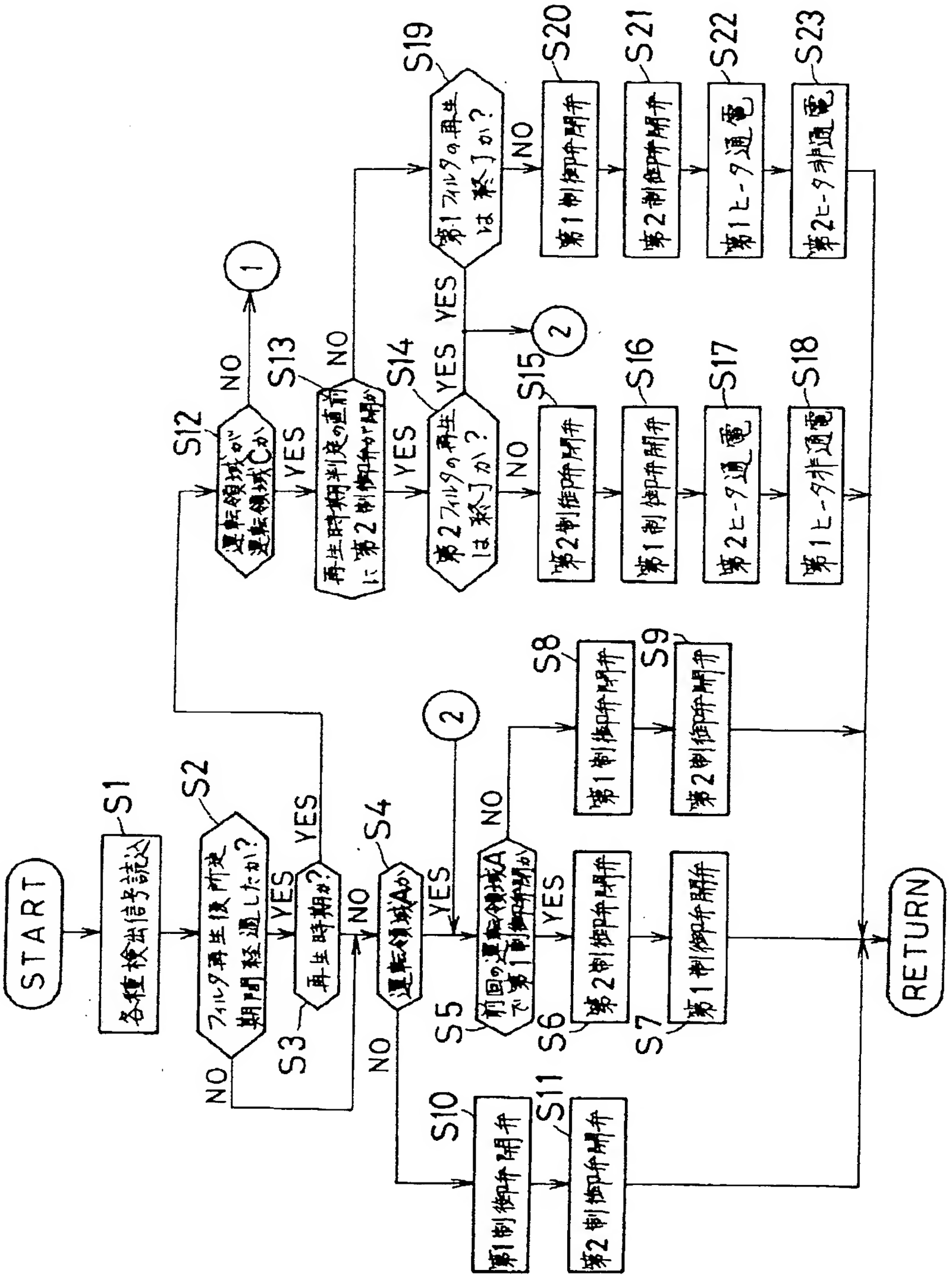
【図１】


P
触媒手段
L
加熱制御手段
O
再生作動禁止手段
I
作動手段
N
加熱触媒手段
K
再生時弁駆動手段
J
再生フィルタ決定手段
H1
H2
B1
B2
C1
C2
D1
D2
弁駆動手段
弁駆動手段
A
G
弁駆動制御手段
M
開弁制御手段
E
再生時期判定手段
F
運転領域判定手段

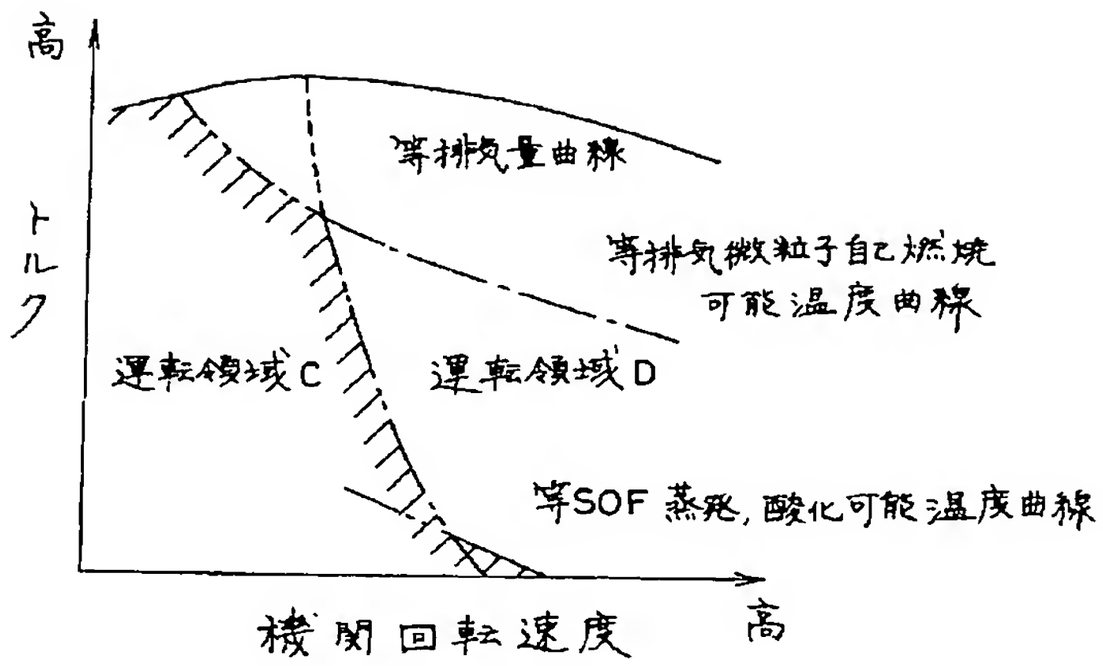
【図２】


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
第1通電回路
第2通電回路
第1補助駆動装置
第2補助駆動装置
制御装置
コントロールユニット
機関回転速度
冷却水温度

【図３】


START
S1
各種検出信号読込
S2
フィルタ再生後所定期間経過したか?
YES
NO
S3
再生時期か?
YES
NO
S4
運転領域Aか
YES
NO
S5
前回の運転領域Aで第1制御弁開か
YES
NO
S6
第2制御弁開弁
S7
第1制御弁開弁
S8
第1制御弁閉弁
S9
第2制御弁開弁
S10
第1制御弁開弁
S11
第2制御弁開弁
S12
運転領域が運転領域Cか
YES
NO
S13
再生時期判定の直前に第2制御弁が開か
YES
NO
S14
第2フィルタの再生は終了か?
YES
NO
S15
第2制御弁閉弁
S16
第1制御弁開弁
S17
第2ヒータ通電
S18
第1ヒータ非通電
S19
第1フィルタの再生は終了か?
YES
NO
S20
第1制御弁閉弁
S21
第2制御弁閉弁
S22
第1ヒータ通電
S23
第2ヒータ非通電
RETURN
1
2
2

【図６】


高
トルク
等排気量曲線
等排気微粒子自己燃焼
可能温度曲線
運転領域C
運転領域D
等SOF 蒸発，酸化可能温度曲線
機関回転速度
高